



# CHEMICAL ABSTRACTS

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## I—APPARATUS

C. G. DERRICK

**Practical tare counterweights.** DR. REICHEL. Hanover. *Chem.-Ztg.* 44, 956 (1920).—Disks of sheet Pb, of about the diam. of a 10 kg. wt., of 2 thicknesses and with a hole in the center to slip over a piece of gas pipe about 20 cm. long, the pipe being mounted on a thick disk for a base, are used for counterweights for the rough adjustments, the final adjustment being made by pouring small shot into a tin box with a hole in the center for slipping over the gas pipe. J. H. MOORE

**Ammonia and benzene column stills.** A. THAU. *Chem. Met. Eng.* 23, 1203-7 (1920).—T. describes the basic principles of designing and operating the modified Savalle column stills used for  $\text{NH}_3$  and  $\text{C}_6\text{H}_6$ . The column stills are controlled by adjusting the steam consumption, the amt. of liquor or oil passing through, the temp., and the compn. of the effluents. The causes for faulty operation are pointed out and certain precautions suggested, one of which is the proper metering of the feed liquor. A special type of flow meter is recommended for this purpose. S. D. KIRKPATRICK

**A practical distillation apparatus.** CARL WOYTACEK. Hamburg. *Chem.-Ztg.* 44, 807 (1920); 1 cut.—A common type of Cu still. J. H. MOORE

**A simple contrivance for safely holding beakers, etc., in the water bath while heating.** HANS HALLER. Munich. *Chem.-Ztg.* 44, 956 (1920).—Stretch 2 pieces of small tubing, or spiral springs, between the handles of the bath and clamp the beaker between them. J. H. MOORE

**"Date" economical Bunsen burner.** ANON. *Chem.-Ztg.* 44, 795 (1920).—Near the top the barrel is bent at an angle of nearly  $90^\circ$  to prevent fouling by dropping in of any fused subst. Burners of 2, 3, and 4 barrels are made, so that after the desired temp. is reached 1 or more may be turned off. J. H. MOORE

**A new micro combustion furnace for the determination of carbon, hydrogen and nitrogen.** W. DAUTWITZ. Zürich. *Chem.-Ztg.* 44, 963 (1920).—Description, with 2 poor cuts, of a furnace which, with absorbers attached, may be clamped to a table. J. H. MOORE

**Research fusing furnace with electrical heating.** HANS HECHT. *Chem.-Ztg.* 44, 956 (1920); 1 cut.—A vertical furnace, permitting the fusion to be watched, mounted on legs, with a circular, adjustable table underneath on which the crucible stands. Attached to the bottom of the furnace are 3 guides which slide in notches in the table, offsets at the top of the guides forming supports for the table when raised into position and turned slightly to left or right. Crucibles with tapholes in the bottom may be used, the melt discharging through a tube extending downward from the table. The crucible content is 550-650 cc., the attainable temp. is  $1650-1700^\circ$ , and an inert gas may be used if desired. J. H. MOORE

**Electrolytic high-current and pole tester for use in the laboratory.** ERWIN PINOFF. *Chem.-Ztg.* 44, 914-5 (1920); 2 cuts.—The first tester is made of 2 pieces of insulated wire about 15 cm. long soldered to 2 clamp pinchcocks of the same size. The insulation is removed from about 2 cm. of the other ends of the wires, for contacts. A glass plate about 9 cm. long and 1 cm. wide is slipped through both pinchcocks and a piece of phenolphthalein paper is clamped on it with the clamps 7-8 cm. apart. The paper

is moistened with  $H_2O$  and, on making contact, a red color will appear at the clamp connected with the cathode. The 2nd tester consists of a glass tube 12 cm. long with rubber stoppers in each end through which Cu wires 2-3 mm. diam. pass, the wire at the contact end being 6 cm. long and extending into the tube 1 cm., the other wire being 3 cm. long and extending in 1 cm. This short wire is soldered to a short piece of insulated wire and the joint wrapped. To the other end of the insulated wire is soldered a Cu wire 6 cm. long which passes through a stopper in the outer end of a glass tube about 5 cm. long, which acts as an insulated handle. To use, the 12 cm. tube is filled with tap  $H_2O$  to which 2 drops of an alc. soln. of phenolphthalein (1:100) are added. When contact is made a red color in one end of the tube shows the cathode. After shaking the app. it is ready for another test.

J. H. MOORE

**A metal-glass tap.** WM. EDWARD GARNER. University Coll., London. *J. Soc. Chem. Ind.* 39, 347-8T(1920); cf. *C. A.* 14, 2567.—A joint is made between a metal disk brazed to the metal capillary and a glass disk formed on the end of the glass capillary. The capillary opening is bored straight through the glass disk, but obliquely through the metal disk, and the two are held in eccentric position by screw compression members, so that when the metal capillary with its disk is rotated, the capillaries may be made to communicate, an indicator on the rotating capillary engaging with a pin at this point.

W. B. V.

**An improved air heater.** F. J. W. BELTON. *Chem. Trade J.* 67, 646(1920).—An app. comprizing a number of similar parts or sections built side by side, and one upon another, and placed between end sections containing air transfer passages, and the inlet and outlet between sideplates. Air enters at the top, passing in streams at high velocity back and forth in horizontal channels, meeting the products of combustion from the gas burners which rise through narrow vertical ducts between several air channels, while suitable horizontal ribs project into the vertical ducts thereby giving the gases a circuitous path. Each vertical section is a portion of two air-heating channels at each side of the portion of gas duct. The structure is held as a unit by bolts clamping the flanges upon the end and side sections. The projecting edges form a good joint with the parts of the sections which seat therearound preventing products of combustion gaining access to the air space of the heater. The gas burners which extend the width of the app. may be high- or low-pressure type. An expt. run gave a thermal efficiency of 87.5%.

W. H. BOYNTON

**A substantial pump for chemical gases and liquids. Pneumatic conveying of chemical salts.** SIEMENS-SCHUCHERT-WERKE. Zürich. *Schweiz. Chem.-Ztg.* 44, 545-9(1920); 4 cuts.—The pump is similar to the "Hytor" pump of the Nash Eng. Co., but the scroll is cylindrical and the impeller placed eccentrically. They are built with capacity of 100 l. to 40 cu. m. air per min., and speeds of 580-3000 r. p. m., and may be used for compressor or exhauster, for the latter purpose giving 99.5% of the theoretical vacuum. With suitable separators they are used for pneumatic conveying, and by charging with suitable liquids, for handling all kinds of gases. J. H. MOORE

**A condensing ballometer.** C. CHRISTIANSEN. *Kgl. Danske Videnskabernes Selskab, Math.-fys. Meddelelser* [II.] 7, 17 pp.(1919).—A detailed description of an instrument to be used in connection with the author's ballometer for detg. the sign and quantity of electric charges carried off by the stream of air and aspirated particles of liquid after passing through the ballometer.

P. M. GLASOE

**"Melde-Kontakt"—an automatic danger signal.** A. PRANGE. *Chem.-Ztg.* 44, 854(1920).—The circuit is closed by the melting of a plug of paraffin, wax, or other substance melting at the highest temp. desired.

J. H. MOORE

Use of autoclaves in chemical processes (CALLAN) 13. Crucibles used in rock

analysis (WASHINGTON) 7. Separation of slimes from liquids by centrifuging (BLOCK)  
13. Evaporimeters (LESAGE) 11B.

**Apparatus for treating liquids with gases.** WM. E. GREENAWALT. Can. 207,839, Jan. 25, 1921. The app. specified comprizes a tank adapted to contain a liquid, a rotary atomizer suspended in the tank and submerged in the liquid and having passages arranged at various distances from its central axis, means for introducing a gas into the tank below the atomizer whereby the pressure in the tank forces the gas through gas passages in the atomizer and means for rotating the atomizer.

**Apparatus for controlling reactions between gases.** C. CONOVER. U. S. 1,363,955, Dec. 28. The chamber in which reaction takes place is a sinuous duct of uniform cross section having no pockets or recesses to retard the flow of gases. Valves are provided for controlling the flow of gases and for regulating the flow of cooling air outside the reaction chamber. The latter may contain a catalyst.

**Controlling gaseous reactions.** C. CONOVER. Brit. 152,671, Oct. 20, 1920. In an app. for effecting reactions, especially catalytic reactions, between gases, the reaction chambers are surrounded by jackets containing cooling liquid in order both to control the temp. of the chambers and to transfer some of the heat developed therein to the walls of a pre-heater. The gases under pressure enter the reaction chambers through restricted openings whereby uniform distribution is obtained.

**Apparatus for treating gases with electric discharges.** E. E. WERNER. U. S. 1,363,827, Dec. 28. The app. is especially adapted for treating air.

**Apparatus for collecting excess acid vapors from digesters, for reuse.** H. D. RANKIN. U. S. 1,364,803, Jan. 4. A plurality of collecting chambers are placed in series above the digester.

**Apparatus for charging liquids and air with radioactive materials.** J. R. PENNINGTON. U. S. 1,363,010, Dec. 21. The app. is adapted for prepg. substances for medical use.

**Rectifying column adapted for distilling liquid air to effect fractional separation.** W. LACHMANN. U. S. 1,363,659, Dec. 28.

**Apparatus for electrically ozonizing air.** W. G. LINDEMANN. U. S. 1,363,000, Dec. 21.

**Apparatus for drawing the temper of hardened saw-blade ends.** R. W. PITTMAN. U. S. 1,362,736, Dec. 21.

## 2—GENERAL AND PHYSICAL CHEMISTRY

W. R. HENDERSON

**Alfred Werner.** J. LIFSCHITZ. Zürich. *Z. Elektrochem.* 26, 514-29(1920).—A survey of Werner's work, particularly on the Co, Cr and Pt amines. H. J. C.

**Edgar Fahs Smith.** FRANCIS P. VENABLE. *J. Ind. Eng. Chem.* 13, 106-7(1921).—A brief biographical sketch. E. J. C.

**The mechanics of solidity.** REGINALD G. DURRANT. *Nature* 106, 440-1(1920); cf. Innes, *C. A.* 15, 194.—Hardness is due in part to closeness of at. packing, and diversities in hardness depend also on how far each substance tested is removed from its melting point. Coeffs. of expansion themselves depend partly on how far the mean range of temp. from which they are calcd. is removed from the m. p. For strict comparison "corresponding temps." should be taken. If this is done for coeffs. of expansion of gases, then the values become identical; with solids the coeffs. should approach but never reach uniformity. W. H. ROSS

**Thermal conductivity of some solid insulators.** J. R. CLARKE. *Phil. Mag.* 4 502-4(1920).—The relation proposed by Thornton (*C. A.* 14, 682) that the thermal



cond. of a substance is equal to the product of the coeff. of elasticity and the d. is tested by the data for a number of Jena glasses. No agreement is found. S. C. L.

Variation of thermal conductivity during the fusion of metals. SHIBEI KONNO, *Phil. Mag.* 40, 542-53 (1920).—See C. A. 14, 1921. S. C. LIND

The rate of chemical action in the crystalline state. C. N. HINSHELWOOD AND E. J. BOWER. *Phil. Mag.* 40, 569-78 (1920).—The evolution of  $O_2$  from  $KMnO_4$  and from solid solns. of  $KMnO_4$  in  $KClO_4$ , the decompn. of  $(NH_4)_2Cr_2O_7$  and of tetranitroaniline were studied at various temps. The change appears to be confined to mols. in the neighborhood of the surface. Where a progressive disintegration of the crystal structure takes place the action is strongly accelerated. Soln. in another solid causes reduction in the rate of reaction. It appears that reaction in the interior of the crystal is retarded because the mols. are under some kind of restraint, possibly due to the attractive forces on all sides, or possibly to internal pressure, the two points of view probably being equiv. S. C. L.

Survey of the physics and chemistry of colloids. THE SVEDBERG. *Chem. Met. Eng.* 24, 23-7 (1921).—A review. JEROME ALEXANDER

Determination of the charge of colloids. RUDOLF KELLER. *Kolloid-Ztg.* 27, 255-7 (1920).—K. quotes his previous work showing that many exceptions exist to the general rule that the migration of dyes depends on the reaction of the fluid. Bethe's criticism (C. A. 14, 3181) is therefore unjustified. A vital factor is the influence of the degree of dispersion on the chem. and elec. properties of colloids. Ordinarily dye solns. contain particles of all degrees of dispersion from gross suspensions down to mol. and ionic dispersion. With these latter the colored cation naturally moves to the cathode; but the colloidal undissociated dye may not so move. Thus very dil. methylene blue migrates to the cathode despite addition of alkali; but in somewhat coarser dispersion it moves partially or entirely to the anode. Following a suggestion of Woborschil of Prague, K. made cataphoretic expts. with thick dye slimes which contain mainly the colloid phase, and give excellent checks against biological controls. The reversal of charge of colloids is not to be expressed in terms of H-ion concn. for chem. combination of stoichiometric character hardly exists between colloids and ions whose wt. and vol. are roughly as 1,000,000,000 to 1. Beyond a certain size colloids must be considered essentially neutral, and therefore charged oppositely to the dispersing fluid. As far back as 1884, John Uri Lloyd showed that concd. acid Fe solns. showed capillary rise in blotting paper, whereas with dil. solns. the hydroxide lagged in proportion to the dilution. Here the cations formed by differential diffusion gradually neutralize the acid which diminishes with diln. So that at great diln. all colloids, even cathodic ones, show a water band in the paper. Eosin, ammonium picrate, and pure molecularly dispersed picric acid if sufficiently dil., are held back by the paper. J. A.

Stable and unstable colloids. F. SCHOUCROUM. *J. physique et radium* 1, 65-76 (1920).—Stable colloids are defined as those not pptd. by the addition of electrolytes to their dispersions; unstable colloids are those so pptd. The decrease in charge causes the particles to coagulate and ppt. This work, done at the suggestion of Perrin, was undertaken to answer the question of P.: whether or not the unstable colloids always show a diminution of charge without reversal of sign, upon the addition of electrolytes. The substances studied were: gamboge, mastic, ferric hydroxide,  $As_2O_3$ . The method was to form a layer of the substance on a plug of glass wool in a U-tube, a p. d. of 10 v. per cm. being maintained through the soln. that bathes the plug and the membrane. The charge on the colloid forming the membrane is then shown by the movement of the liquid. Mastic, gamboge,  $As_2O_3$  (negative colloids) showed a decrease in charge with increasing concn. of  $H^+$ , but no reversal of the charge.  $Fe(OH)_3$  (positive colloid) shows the same phenomena with increasing  $OH^-$ , but no reversal of charge. The method was then extended to stable colloids (positive in acid soln., negative in alk.)

by observing their protective action upon the unstable colloids previously studied. This was resorted to because forming a membrane of the stable colloids in question (albumin and gelatin) was found to be difficult. With albumin in a soln. bathing a mastic membrane, a reversal of sign was noted. With gelatin, no reversal was noted and the negative charge was decreased by  $\text{OH}^-$  and increased by  $\text{H}^+$ . This apparent anomaly was explained by the superimposed effects of the gelatin and mastic. (No mention is made of Loeb's application of collodion membranes in a similar study of amphoteric colloids by electro-osmosis.)

H. W. BANKS, 3RD.

**The precipitation of colloids.** HUMPHREY D. MURRAY. *Phil. Mag.* 40, 578-85 (1920).—M. has been engaged in an attempt to obtain a general expression for the ptpg. effect of ions on colloids, which has up to the present not been successful, but an expression has been found applicable to univalent cations with the same anion in the pptn. of a colloid carrying a negative charge.  $C = K.N^n$ , in which  $C$  is the minimal concn. that produces colloidal pptn.,  $N$  is the at. number of the cation,  $n$  is const. for the colloid at a given concn.,  $K$  is a const. depending on the nature of the colloid and the anion. Results of Oder for colloidal S were used to test the relations, by plotting the log  $C$  against log  $N$ . For the anion  $\text{Cl}$ ,  $C_1 = 5.9N^{-1.44}$ , when  $C_1$  refers to univalent cations. For bi- and poly-valent cations not enough data were available to test the constancy of the relation, but assuming it to be the same form as for univalent cations and that Ba and Al are typical for bi- and tri-valent cations, one would have the expressions,  $C_2 = 1.46N^{-1.44}$  and  $C_3 = .33N^{-1.44}$ . Cations with  $\text{NO}_3^-$  follow approx. the same rule as with  $\text{Cl}^-$ . For the pptn. of colloidal  $\text{As}_2\text{S}_3$  by  $\text{Cl}^-$  results of Freundlich were used and again the values for univalent ions lie approx. on a straight line, and the equation is  $C_1 = 0.55N^{-0.99}$ . The number of values for bivalent cations is larger in this case, but they are not very concordant, a line drawn among them parallel to the other would be expressed by  $C_2 = 0.0008184N^{-0.99}$ . Whetham's law requires that the minimal concn. for any uni-, bi- and tri-valent ions should be for the same colloid in the ratio  $K^3:K^2:K$  or  $K^2:K:1$ . In the case of S the values for  $C_1:C_2:C_3$  would be  $5.9:1.46:0.33$  or  $(4.2)^2:4.4:1$ , so that Whetham's law applies when the values of  $N^n$  are nearly equal. To Freundlich's results for  $\text{As}_2\text{S}_3$  the law does not appear to apply but only one value is available for a trivalent cation. In seeking to apply the rule to pptn. of colloids by anions one is confronted with a difficult choice of a value for  $N$  in the case of complex ions, the commonest type. Results of Freundlich for the pptn. of  $\text{Fe}(\text{OH})_3$  by  $\text{KCl}$ ,  $\text{KBr}$  and  $\text{KI}$  and the equation  $C = 0.00215N^{0.48}$  is applicable.

S. C. LIND

**Mechanism of catalytic processes.** HUGH S. TAYLOR. *J. Ind. Eng. Chem.* 13, 75-9 (1920).—The author has undertaken a systematic study of the magnitude of the adsorption effect with a series of gases and a number of catalytic agents. In the present paper results are given for the adsorption of  $\text{He}$ ,  $\text{H}$ ,  $\text{N}$ ,  $\text{CO}$ , and  $\text{CO}_2$  by  $\text{Ni}$  and  $\text{Cu}$ . The intermediate compd. theory of catalysis is briefly discussed. E. D. WILLIAMSON

**Adsorption by precipitates. III. Adsorption of precipitating ions by hydrous aluminium oxide.** HARRY B. WEISER AND EDMUND B. MIDDLETON. Houston, Texas. *J. Phys. Chem.* 24, 680-63 (1920); cf. *C. A.* 14, 1246.—The pptn. concns. of a number of electrolytes for colloidal hydrous  $\text{Al}_2\text{O}_3$  were detd. The order of pptn. concn. expressed as equivalents per l. is as follows for the ions studied, beginning with the lowest value: ferrocyanide, thiosulfate, ferricyanide, citrate, sulfate, oxalate, phosphate, chromate, dithionate, dichromate, chloride, nitrate, bromide, iodide. The adsorption of a number of pptn. ions by hydrous  $\text{Al}_2\text{O}_3$  was detd. by direct analysis, a very detailed account of the method being given. The amts. of the various ions carried down by the pptd. colloid were not even approx. equiv. Although the adsorption of equiv. amts. will neutralize a definite amt. of colloid, the actual amts. of ion carried down by the ppt. will not be equiv., since the amts. absorbed after pptn. will vary with the

adsorbability of the ions. The order of adsorption beginning with the ion most readily adsorbed is: phosphate, ferrocyanide, ferricyanide, oxalate, sulfate, chromate, thio-sulfate, dithionate, dichromate. It is evident from the examn. of the two series that there is no simple relation connecting the pptn. values and the adsorbability.

C. R. PARK

**Surface tension of certain soap solutions and their emulsifying power.** MOLLIE G. WHITE AND J. W. MARDEN. Univ. of Missouri. *J. Phys. Chem.* **24**, 617-29(1920).—Surface tensions of solns. of varying concns. of Na palmitate and Na stearate are measured. The surface tension decreases rapidly with the concn., *e. g.*, in the case of the palmitate it changes from 49.69 dynes per cm. when the concn. is 0.0102 g. per 100 cc. to 20.22 when the concn. is 0.1632. The relative emulsifying power of solns. of Na palmitate and Na stearate for kerosene and linseed oil was detd. by shaking by hand for 5 min. and observing the time of noticeable sepn. The emulsifying power is shown to increase with decrease in the surface tension. The viscosity also has a marked influence on the permanence of the emulsion. Emulsions containing 5 cc. of kerosene per 10 cc. of soap soln. break down more rapidly than emulsions containing 2 cc. of kerosene, while the reverse is true of emulsions containing 2 cc. and 5 cc. resp. of linseed oil, to 10 cc. of soap soln. The presence of glycerol does not affect the surface tension to any large extent. A large amt. of  $\text{Na}_2\text{CO}_3$  raises the surface tension and is therefore not desirable in cleansing soaps.

C. R. PARK

**Swelling phenomena in fibrous alumina.** HEINZ V. ZEHMEN. *Kolloid-Z.* **27**, 233-5(1920).—Both the "fibrous alumina" (H. Wislicenus, *Z. angew. Chem.* **17**, 805 (1904)) as prepared by E. Merck, and the so-called "sprouted alumina" (C. A. I., 2038) which is ignited and therefore converted into  $\text{Al}_2\text{O}_3$  and freed from Hg, behave like reversible gels, resembling the gels of  $\text{SiO}_2$  and  $\text{ZrO}_2$  (studied especially by van Bemmelen) in their adsorption and loss of water. Dehydration between 100° and 200° proceeds gradually, each temp. corresponding to a certain water content. The Merck prepn. loses 6.5% at 100°, a further 3% at 150°, and 2-3% at 200°. On exposure to the air this moisture is regained to within about 1% (hysteresis), 10% within one day and the rest after 5-6 days. After several weeks in an atm. satd. with  $\text{H}_2\text{O}$  vapor, the water adsorption may equal 60%. The swollen fibrous clay shows a marked increase in vol. and adsorbs much more Congo red than would be expected from its  $\text{Al}_2\text{O}_3$  content, in some cases over double, which seems to be due to the increase in the active internal surface accompanying dispersion.

JEROME ALEXANDER

**The viscosity of colloidal solutions.** PAUL BARY. *Compt. rend.* **170**, 1388-90 (1920).—The author believes that a study of the swelling of colloids in suspension can be made by an analysis of viscosity measurements on sufficiently dil. colloidal solns., and that interesting information can be obtained in this way. He proposes, in place of using Einstein's formula ( $\eta = \eta_0(1 + 2.5\nu)$ ), in which  $\eta$  and  $\eta_0$  represent, resp., the viscosity of the suspension and that of the pure medium, and  $\nu$  the vol. of matter dispersed in a unit of the total vol., for the predetermination of viscosities, to utilize measurements of viscosity for calculating the swelling of the suspended colloid. Colloids which become suspended in the chosen medium without the assistance of any exterior agent furnish liquids in which the colloid progressively loses its swelling with time to a degree which depends upon the concentration and the temp. The reduction is accentuated with dilution, and tends toward zero for infinite dilution. This result seems in accord with ultramicroscopic observations which show the magnitude of the granules increasing with the concentration, and affirms that this increase occurs because of polymerization of the material with the development of colloidal properties.

R. E. HALL

**The strength of carbonic acid at higher pressures.** OTTO HABHNEL. *Centr. fin. Geol.* **1920**, 25-32.—Lead pipes used as mantles for underground elec. cables

are frequently corroded through, in some instances within 4 weeks. Lead carbonate is found at the corroded places and therefore the corrosion was believed to be due to  $\text{H}_2\text{CO}_3$ . Since this appears incompatible with the weakness of the acid, a redtn. of the soly. and cond. of  $\text{CO}_2$  at high pressures was made, with results as follows:

P atm.	S <sub>a</sub>	S <sub>li</sub>	S <sub>g</sub> /P.	S <sub>li</sub> /P.	C.	100 <sub>g</sub> .	C <sub>li</sub>	100 <sub>g</sub> .
1	1.80	1.00	1.800	1.000	0.35	0.140	0.20	0.4055
5	8.71	4.59	1.742	0.920	1.71	0.667	0.90	0.789
10	15.89	8.39	1.589	0.839	3.12	0.919	1.65	1.088
15	21.82	11.85	1.455	0.790	4.28	1.063	2.33	1.330
20	26.53	15.21	1.326	0.761	5.21	1.186	2.99	1.515
25	30.46	17.64	1.218	0.756	5.98	1.250	3.47	1.678
30	33.65	20.31	1.122	0.677	6.61	1.282	3.99	1.764
35	36.73	22.52	1.050	0.643	7.21	1.318	4.42	1.831
38	37.87	...	0.997	...	7.44	1.326	...	1.882
40	...	24.44	...	0.611	...	...	4.79	1.911
45	...	25.59	...	0.569	...	...	5.03	1.940
50	...	27.06	...	0.541	...	...	5.31	1.971
52	...	27.67	...	0.532	...	...	5.44	1.983

$S_0$  = satn. coeff. = vol.  $\text{CO}_2$  per one vol.  $\text{H}_2\text{O}$  at  $0^\circ$  = % wt.  $\text{H}_2\text{CO}_3$  at  $0^\circ$ ;  $\lambda$  = cond. The above table indicates that  $\text{H}_2\text{CO}_3$  is a very weak acid. However, it has been shown by Thiel and Strohecker, who were able to greatly retard the reaction  $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$  by adding compds. of the phenol class, that in a 0.038% sol. of  $\text{CO}_2$  at  $4^\circ$  C. only 0.56% was present as  $\text{H}_2\text{CO}_3$  and that this small fraction only is ionized. Assuming provisionally that only this small proportion of  $\text{CO}_2$  is hydrated at all pressures and calculating the ionization constant on this basis, H. gets  $K = 4.4 \times 10^{-4}$ , and finds that 91%  $\text{H}_2\text{CO}_3$  is ionized.

OTTO VON SCHLICHTEN

**Hypophosphorous acid.** II. Its reaction with iodine. ALER. D. MITCHELL. *J. Chem. Soc.* 117, 1322-35 (1920); cf. *C. A.* 14, 3353.—In detg.  $\text{H}_3\text{PO}_2$  by  $\text{HgCl}_2$  evidence was obtained that the oxidation to  $\text{H}_3\text{PO}_3$  involves 2 reactions, the first of measurable velocity, in which  $\text{HgCl}_2$  takes no part; the second, of great velocity, in which  $\text{HgCl}_2$  functions. The reaction with  $\text{I}_2$  was found to be accurately comparable and was first investigated. Comparative expts. showed the measurable velocity to be identical with that of  $\text{I}_2$  and  $\text{HgCl}_2$ . The results of Steele (*C. A.* 2, 504) were in general confirmed but the discrepancies noted by S. are shown to disappear when consideration is taken of (1) the influence of  $\text{I}_2$  concn. on the measurable velocity, this influence being slight at moderate diln. but relatively large at greater diln., and (2) the effect of  $\text{HCl}$  and  $\text{HI}$  on ionization of  $\text{H}_3\text{PO}_2$ . The  $\text{I}_2$  ion is shown to be the active factor and from extensive exptl. data the following hypothesis is advanced to explain all the anomalies previously noted. The  $\text{H}_3\text{PO}_2$  molecules are in equil. with a very small proportion of an "active" form (possibly  $\text{H}_4\text{PO}_3$ ) which reacts rapidly with  $\text{I}$ :  $\text{H}_4\text{PO}_3 + \text{I}_2 \rightarrow \text{H}_3\text{PO}_3 + 2\text{HI} + 3\text{I}^-$ . The restoration of the equil. thus displaced is accelerated by  $\text{H}$  ions, and forms the measurable reaction,  $\text{H}_3\text{PO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_4\text{PO}_3$ .

A. R. MIDDLETON

The thickness of the capillary film between homogeneous phases of liquid and vapor especially of carbon dioxide. G. BAKKER. *Ann. Physik.* 61, 273-302 (1920); cf. *C. A.* 13, 1277.—The author deduces the equation  $T^2 d(H/\zeta T)/dT = [(E_l - E_g)/2] - E_u$  in which  $H$  is the surface tension,  $\zeta$  the thickness of the capillary film,  $T$  the abs. temp., and  $E_l$ ,  $E_g$ , and  $E_u$  are the energy densities of the liquid, vapor, and the unstable intermediate phases, resp. By its use he obtains the following values:

$t$ :	$-30^\circ$	$-10^\circ$	$0^\circ$	$10^\circ$	$20^\circ$
$\zeta$ :	1.46	1.7	2	2.6	3.6

By an independent method, very close agreement with these values is obtained. For benzene and ether, the following data were obtained,  $N$  being the number of mol. films in the capillary film:

BENZENE.									
$t$ :	5.4°	50	80	100	150	200	250	275	280
$N$ :	2.4	3	3.2	3.4	3.5	4	6.4	10.8	16
ETHER.									
$t$ :	0°	20	50	80	120	170	190	193	
$N$ :	2.4	3.3	3.3	4.2	5	7.8	16.4	31.5	

R. E. HALL

Possible relation between mechanical, electrical, and chemical quantities. CARL HERRING. *Science* 52, 637 (1920); cf. *C. A.* 15, 460.—In the work previously reported H. used only univalent metals, so he generalizes the relation there found by substituting equiv. wt. for at. wt. in the relation  $\text{grams} \times g = 10 \times \text{coulombs} \times \text{at. wt./g.}$

A. E. STEARN

An attempt to explain electrochemically the catalytic action of the metals belonging to the platinum group. VLADISLAV HAAS. *Chem. Listy* 14, 106-9 (1920).—The catalytic action of the Pt group of metals is considered to be an electrochem. phenomenon of which a typical case would be the soln. of c. p. Zn in an acid medium in contact with Pt. During the catalytic action of the rare elements, their cond., ability for adsorption and electropositivity (with respect to the H electrode) are of great importance. The catalytic power of the rare metals depends on the fact that they play the role of a conducting electrode, completing a galvanic element. This is true of all cases, gaseous or otherwise. H. attempts to apply this theory to the catalytic decompn. of HCOOH into  $H_2$  and  $CO_2$  using Rh (*C. A.* 11, 739). The tension required for the decompn. of this acid using Pt electrodes is very weak (around 0.24 v.). H. successfully constructs a galvanic battery based on the spontaneous decompn. of formic acid. This consists of immersing a Pt electrode into a neutral soln. of sodium formate from which a soln. of a mineral acid such as HCl or  $H_2SO_4$  is sepd. by a diaphragm. A second electrode is immersed in this mineral acid soln. The system is kept at 90°. When the circuit between the electrodes is completed the one immersed in the mineral acid becomes the positive electrode. This allows the separate evolution of the two gaseous products of decompn.  $H_2$  and  $CO_2$ , and therefore simplifies their detn. J. M. K.

Microscopy with ultraviolet light. J. E. BARNARD. *Nature* 106, 378-81 (1920).—A review. W. H. ROSS

Dispersion by refraction of hydrocarbons. E. DARMOIS. *Compt. rend.* 171, 952-5 (1920).—The difference,  $n' - n$  or  $\Delta n$ , between the refractive indices for 2 spectrum lines (generally  $H\alpha$  and  $H\gamma$ ) are quite irregular in going from one hydrocarbon series to another. In the same series, however, it increases regularly with the mol. wt. just as does the density,  $d$ , so that the function  $\Delta n/d$  is found quite const. for any one series though it varies from one series to another.  $d$  is the density at the temp. where  $n$  and  $n'$  are measured. The following values for this const. were given:

(1) Satd. aliphatics.....	155 $\pm$ 2
(2) Satd. cyclics (cyclohexane).....	151 $\pm$ 3
(3) Unsatd. cyclics (one double bond).....	191 $\pm$ 2
(4) Unsatd. aliphatics (one double bond).....	194 $\pm$ 3
(5) Unsatd. aliphatics (two double bonds).....	230 $\pm$ 4
(6) Benzene series.....	305 $\pm$ 5

By these measurements, then, one can obtain an approximate idea of the principal series constituting an unknown crude petroleum. A. E. STEARN

The thermal variation of the coefficient of magnetization of certain solid anhydrous chlorides and oxides, and the magneton theory. PH. THEODORIDES. *Compt. rend.*

171, 948-50(1920).—Over wide temp. ranges the coeff. of magnetization of anhydrous  $\text{NiCl}_2$ ,  $\text{CoCl}_2$ ,  $\text{MnCl}_2$  and  $\text{MnO}$  is a simple function of the temp. exactly reversible and following Curies' law  $X(T - \theta) = C$ , where  $X$  is the sp. coeff. of magnetization,  $T$  is abs. temp.,  $\theta$  is the Curie pt., and  $C$  is Curies' const. Taking the "magneton-gram" as 1123.5 c. g. s. units T. finds whole numbers for the no. of magnetons in the chlorides of Co and Ni, supporting the theory, but for  $\text{MnCl}_2$  and  $\text{MnO}$  the number is fractional.

A. E. STEARN

**Catalysis.** E. HERRERO DUCLOUX. *Universidad Nacional de La Plata. Revista de la Facultad de Agronomía y Veterinaria* 13, 173-89(1918).—A lecture. A. R. M.

The chemical interpretation of the crystal lattice. A. REIS. *Z. Elektrochem.* 26, 529(1920); cf. *C. A.* 15, 196.—A correction. H. JERMAIN CRRIGHTON

The optical principles of refractometry and the most important designs of refractometers. W. ROTH. *Z. angew. Chem.* 33, I, 249-51(1920).—Elementary review of the subject matter, including interferometry, and brief reference to the history of refractometry.

W. B. V.

Untenable present theories of the sun's heat. GEORG WUTKE. *Naturw. Umschau Chem.-Zig.* 9, 147-8(1920).—The meteoric, contraction, and chem. theories of Mayer, Helmholtz and Arrhenius, resp., together with a modern Ra theory are discussed and found wanting.

L. W. RIGGS

A national policy for British chemists. H. LEVINSTEIN. *Chem. Age (London)* 3, 500-1(1920).—An address.

W. H. BOYNTON

Density of aluminium (EDWARDS, MOORMAN) 9. Some applications of the photoelectric cell to practical photometry (STORY) 4. Normal colors and harmony of colors (OSTWALD) 19. Theory of quanta and the magneton (PAULI) 3.

KAUFFMANN, HUGO: Beziehungen zwischen physikalischen Eigenschaften und chemischer Konstitution. Stuttgart: F. Enke. 421 pp. M. 60. For review see *Z. physik. Chem.* 96, 499(1920).

Uitvoerproducten van Nederlandsch-Indië: Kemiri-olie; balam- en soenteipitten; drakenbloed; patchouli. Buitenzorg: Publicatie van de afd. Handel v. h. Dep. V. L., Nen H. f. 2.50. For review see *Oliën en Vetten* 5, 315(1921).

### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

**Origin of the elements.** J. H. VINCENT. *Proc. Phys. Soc. London* 32, 271-90 (1920).—The view is advanced that all the elements are genetically connected, the process leading from one to another being similar to that known to occur in radioactive elements. The radioactivity of the ordinary elements is not in general detectable by the usual methods because of the low velocities of expulsion of the particles. In consequence the atomic weights must be regarded as the weighted mean values of the atomic weights of the isotopes of the elements (which are all integral values, on the basis  $O = 16$ ). The existence of such isotopes in the case of a number of elements has been demonstrated by the recent work of Aston. As a rule the atomic weight is near that of some one isotope. The assumption that the elements have descended from other elements by the expulsion of alpha and beta particles accounts for the existence of those isotopes whose atomic weights are divisible by 4 without a remainder, that is, of class 0. According to the value of the remainder when the atomic weight is divided by 4, we also have isotopes of class 1, class 2 and class 3, resp. To account for the existence of these, it is necessary to assume provisionally that there is at least one other type of radio-

active transformation in which the particle emitted has an odd atomic weight greater than 4. Figures and tables are drawn up in the original article showing how these views account for the values of a large number of atomic weights, and also for certain observed empirical relations between the atomic weights and the Moseley numbers of elements of low atomic weight. Finally, V. considers that under certain conditions radioactive processes may be reversed and the elements built up. If the assumption is made that all the elements are undergoing radioactive transformation, the conclusion is forced on us that ultimately all the present contents of the earth will degenerate to the various isotopes of hydrogen and helium, and leak away. Expts. are suggested for detg. whether helium is actually being produced to any measurable extent from some of the ordinary elements.

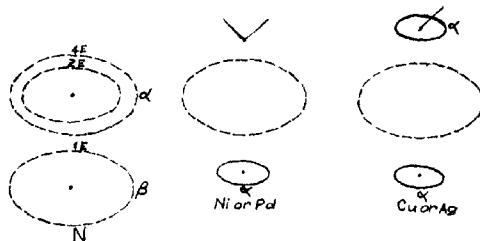
SAUL DUSHMAN

**Cubical atoms.** A. LANDÉ. *Physik. Z.* 21, 626-8(1920).—The cubical atom consists of a positively charged nucleus and 4 to 8 electrons. The latter are arranged according to the laws of symmetry of a cube. Thus, in the case of 4 electrons, these are arranged so as to perform circular or elliptical orbits on each of the four faces of a symmetrical tetrahedron. The conditions are such that these electrons never collide at points where their orbits cross. This arrangement represents the C atom. A modification of this leads to the cube with 8 electronic orbits. Behind each of the four electrons arranged as above, a second electron has an orbit inclined at  $75^\circ$  to the one in front. This arrangement is more stable, since it possesses less potential energy than one with 8 electrons in a plane. It is necessary to assume furthermore that in the normal state the electronic orbits correspond to the quantum value 2. The values of the aphelion radii are as follows: Na,  $0.605 \times 10^{-8}$  cm.; F ion,  $0.875 \times 10^{-8}$  cm. On addition to the latter of H ion, this takes up a position on one of the corners of the cube at a distance of  $0.945 \times 10^{-8}$  cm. from the F nucleus. The ionization energy for HF is calcd. as 350 cal.; for Ne, 550 cal. (corresponding to 23.8 volt). The O ion, with two negative charges, must consist of two cubes, symmetrically arranged one inside the other, with 4 electrons in each cube, executing circular orbits. Radius of O ion is found to be  $2.2 \times 10^{-8}$  cm. The three moments of inertia calcd. for  $H_2O$  are found to be in agreement with the values calcd. by Eucken and E. V. Bahr (from infra-red absorption spectra). For the neutral C atom, the aphelion radius is  $1.3 \times 10^{-8}$  cm., which is in agreement with certain observed properties of the diamond. In the discussion of this paper Nernst asked how Li ion, LiH, and solid H would be represented. Born suggested that in the latter case the nuclei are arranged in a cubical lattice, with an electron placed in one side of each cube, so as to form mirror images in the other sides. In this manner the motions of all the other electrons are controlled by that of any one.

SAUL DUSHMAN

**Binuclear theory of the atom and the periodic system.** O. HINSBERG. *J. prakt. Chem.* 101, 97-112(1920); cf. *C. A.* 14, 1253.—Periods 1, 2, 4, 6, 8 of the periodic system, as usually written, are called *A* series while periods 3, 5 and 7 are the *B* series. The first series includes H and He, with which latter a ring of two electrons is completed so that an equalization of valencies within the atom is brought about with resulting chem. inactivity. Li has one electron in an outer ring, Be has 2, B 3 and C has four, completing an  $\alpha$  nucleus. After C there is a big jump to N and a second or  $\beta$  nucleus is postulated containing a one-electron ring. In O the  $\beta$  nucleus has 2 electrons in its ring, in F there are three and in Ne with four electrons there is an equalization of valencies within the atom resulting in inertness. From N to Ne there is a const. increase in at. vol. indicating increased sepn. of the two nuclei. This agrees with Rutherford (*C. A.* 13, 2481) whose work on decompn. of N indicates a binuclear theory. This structure also allows of an explanation of the "onium" compds. ( $NH_4$ , etc., cf. *C. A.* 14, 1254). A similar development of a  $\beta$  nucleus in Groups V-VIII occurs in periods 4, 6 and 8 similarly. When the O valence is plotted against atomic number (in a

manner essentially the same as that of Haekh, *C. A.* 12, 1607] it is seen that the atoms in the *B* periods, 3 and 5, have two "preferred" valence electrons different from all others. The sharp fall of valence at the end of these two *B* periods is probably due to a partial intratomic equalization of valences similar to that which results in the formation of the noble gases. There is also a vol. decrease indicating that 2  $\alpha$  nuclei repel each other less strongly than do an  $\alpha$  and a  $\beta$  nucleus. At the end of 3 and 5 there have accumulated enough electrons to complete an  $\alpha$  nucleus. Thus the 2 preferred electrons of Ni or Pd are drawn in and a new valence electron is joined on to form Cu or Ag. In Cu one of the electrons is reversible. However the increase in at. volumes along the periods beyond Cu and Ag is hard to explain, as is the change from 7 to 8 where the elements, Pt, Au, Hg, etc., have more than one valence. Periods 1, 2, 4, 6 and 8 come to an end with the completion of a  $\beta$  nucleus while the other periods end with the formation of a perfected  $\alpha$  nucleus. A linkage of the  $\alpha$  nuclei is sug-



gested similar to that between C atoms in hydrocarbons. The small vol. of the very heavy elements indicates that the  $\alpha$  and  $\beta$  nuclei do not lie altogether outside of each other but that the nuclear charge is probably coned. at two poles giving the effect of sep. nuclei for all the elements beyond C. There are three types of electrons within an atom: (1) nuclear electrons; (2) valence electrons which in mol. formation bring about equalization of charges with other nuclei and which det. the optical and chem. properties; (3) ring electrons which revolve according to the simplest assumption in a plane at right angles to the axis joining the nuclei of the atom. These may be either reversible as in Cu or the ordinary irreversible electrons which are quite distinct from valence electrons. They are formed by inactivation of a valence electron of some lower element and are of only secondary importance as regards phys. and chem. properties. Mol. formation may be regarded as an extension of at. formation, there occurring an equalization of nuclear charges which are not completely equalized in the atom. Where this equalization does occur as in the noble gases there is no reactivity. Mols. are higher-order atoms.

F. O. A.

**Electrostatic potential of spatial atomic models.** TONIO RELLA. *Z. Physik* 3, 157-68(1920).—R. calcs. as a series approximation the mutual electrostatic potential of two atom models that consist of arrangements of electrons at points about a positive nucleus that have cubic or tetrahedral symmetry. The results are extended to the case where the electrons are not stationary, but revolve in small orbits that have the proper symmetry relations, in the manner developed by Lande (*C. A.* 14, 3571).

F. C. HOYT

**Positive-ray analysis of magnesium.** A. J. DEMPSTER. Univ. Chicago. *Science* 52, 559(1920); cf. *C. A.* 12, 1724.—When a Mg anode is heated to vaporize it slightly three isotopes of at. wt. 24, 25 and 26 appear. These can be compared with  $N_2$  or CO, mol. wt. 28. The amts. of the three occur in the ratio of 6 parts of at. wt. 24 to



1 part each of the others giving an av. at. wt. of 24.375 as compared with the chem. wt. of 24.36. F. O. A.

**Age of the autunites of Portugal.** A. MUGUET AND J. SEROIN. *Compt. rend.* 171, 1005-6(1920).—The autunites present a ratio of Ra/U generally less than  $3.4 \times 10^{-7}$ . This figure, established by Rutherford and Boltwood, represents the amt. of Ra in equil. with 1 of U. It is possible, knowing the amt. of Ra and U in a mineral, the period of Ra being about 1750 years, to calc. the time elapsed since the sepn. of Ra and U in such minerals. Very exact analyses of 2 av. samples from a mine near Guarda gave Ra/U =  $1.42 \times 10^{-7}$  and  $1.94 \times 10^{-7}$ , resp., which correspond to 1250 and 1900 years and indicate a max. age of 2000 and a minimum of 1000 years. Equil. between Ra and U in these autunites should be attained in about 15,000 years. It is possible to learn in a similar way the ages of torbernite and carnotite. L. W. RIGGS

**The chemical effects of alpha radiation.** EUGÈNE WOURTSEL. *J. physique et radium* [6] 1, 77-96(1920).—A treatment of the theory of the radiochemical action of the  $\alpha$  particle, employing exptl. data previously obtained by W. (C. A. 14, 3588) and others. A theory of chemical action by shock, as opposed to the ionic theory, is developed. W. shows that the chemical action of  $\alpha$  particles on a gas is a function of the number of collisions with the gas mols. and is otherwise independent of the pressure. Some of the well known relations developed from ionization also apply to chemical action regarded as a result of bombardment but are not necessarily identical with them. The various formulas for the estn. of  $M/N$  ( $M$  = number of mols. reacting,  $N$  = number of ions) are considered and applied to exptl. data from various sources. W. calcs. the number of encounters per sec. per millicurie emanation (in equil. with Ra A and C) for the gases  $H_2S$ ,  $NH_3$ ,  $N_2O$  and  $2H_2 + O_2$ . For the decompn. of  $H_2S$  and  $NH_3$ , the number of mols. decompd. at lower temps. is less than the number of collisions, but approaches it at higher temp., indicating that the encounters become more effective chemically at higher temp. In the case of the decompn. of  $N_2O$  the number of mols. reacting exceeds the number of collisions at all temps., which W. attributes to secondary reaction. The well known low temp. coeff. of radiochemical actions is in accord with the theory which requires that the temp. coeff. should become zero in the temp. range within which the encounters are 100% efficient chemically. In calcg. the number of encounters, the dimensions of the  $\alpha$  particles are assumed to be those of the He at. S. C. LIND

**Concerning an article by I. Langmuir and an article by R. W. Wood.** L. DUNOYER. *Compt. rend.* 171, 903-4(1920).—D. thinks that Langmuir (C. A. 10, 2544) should give him the priority on the study of rectilinear propagation of mols. in a vacuum since Wood (C. A. 9, 2730) obtained positive results only after using D.'s exptl. procedure (C. A. 7, 3878). F. O. A.

**Identification and designation of electrical discharge processes.** W. SCHOTTKY. *Z. tech. Physik* 1, 208-9(1920).—A plea for a more precise nomenclature in discussing elec. discharge phenomena. S. would differentiate these in accordance with (1) the location (cathode, anode or gas space), (2) mode of production (thermal or non-thermal) and (3) stability, that is, whether the discharge is maintained by some external source, or (once started) maintains itself. A number of terms, of Greek derivation, are suggested to define the different types of discharge. SAUL DUSHMAN

**The conduction of electricity by free electrons and carriers. III. The rapidity of motion of particles under stress in retarding media.** P. LENARD, with contributions by W. WEICK AND HANS MAYER. Heidelberg. *Ann. Physik.* 61, 665-741(1920); cf. C. A. 7, 3894; 14, 892.—The author discusses the rapidity of motion for various relations of the mol. of the medium to the surface of the particle which can have an influence, especially for diffuse reflection and for the inclusion of the mol. of the medium in the surface layer of the particle, and its later extrusion. With consideration as

well of historic development as uses, section 7 comprizes a coördination of our present knowledge of the kinetic formulas for rapidity of motion of the partides. Section 8 investigates the province of the validity of the gas-kinetic and the hydrodynamic formulas for the rapidity of motion, and their mutual correspondence. Section 9 considers liquid media and shows the manner in which the gas-kinetic treatment is applicable to this, and where its limits and those of the hydrodynamic treatment lie. Observations are included here also in regard to friction in liquids and expts. on friction in elec. fields. The results are used for a thorough investigation of electrolytic ions, which leads to the attainment of their radii and water content. Ionic nuclei and water mols. are found in part lying within one another, with marked space contraction. Section 10 summarizes the formulas deduced for rapidity of motion. R. E. HALL

**Equipotential surfaces of cathode rays under the influence of an opposing electric field.** W. LOHR. Univ. Berlin. *Z. Physik* 3, 130-40(1920).—Cathode rays, after passing through an anode net, are subject to a retarding field which makes an angle with the direction of the rays. The distribution of potential is then explored with a small Pt wire moved about in the tube. The equipotential surfaces are not symmetrical with respect to the parabolic path, and are not parallel. In general they are nearer the retarding plate on the incident side. The existence of free space charge is clearly shown. This throws some doubt on the quant. methods of measuring the excitation function as used by Seeliger and Mierdel (*C. A.* 14, 3361). F. C. HOYR

**Studies with the ionization gage. I. Construction and method of calibration.** S. DUSHMAN AND C. G. FOUND. *Phys. Rev.* 17, 7-19(1920); cf. *C. A.* 14, 2582; 15, 193. —A more detailed description is given of the gage than in the above references. Curves are given showing the relation between anode voltage, electron emission, pressure, and ionization current for A, and the conditions are detd. under which the ionization current varies linearly with the pressure. The capillary flow method (based on Knudsen's laws) of calibrating a gage at very low pressures against another gage at higher pressures, is described fully. The ionization gage can be used with an ordinary sensitive galvanometer to indicate pressures as low as  $10^{-4}$  bar. Two methods of connecting the electrodes in the gage are described and a comparison is given of the relative sensibilities. SAUL DUSHMAN

**Ionization and resonance potentials of some non-metallic elements.** F. L. MOHLER AND PAUL D. FOOTE. *Bur. Standards, Sci. Papers* No. 400, 669-700(1920); cf. *C. A.* 15, 14.—By using a four-electrode tube with an extra grid close to the hot cathode it is possible to make different connections so as to get valuable checks on ionization and resonance potentials,  $V_i$  and  $V_r$ . The greatest trouble was the formation of films on the electrodes so that they had to be renewed frequently. The following values were obtained by two or more methods. For P,  $V_r = 5.80 \pm 0.1$  v.  $V_i = 13.3 \pm 0.5$  v. For I,  $V_r = 2.34 \pm 0.2$  v.  $V_i = 10.1 \pm 0.5$  v. For S,  $V_r = 4.78 \pm 0.5$  v.  $V_i = 12.2 \pm 0.5$  v. For N,  $V_r = 8.18 \pm 0.1$  v.  $V_i = 8.7 \pm 8.18 = 16.9 \pm 0.5$  v. For O,  $V_r = 7.91 \pm 0.5$  v.  $V_i = 7.9 + 7.6 = 15.5 \pm 0.5$  v. For H, First  $V_r = 10.4 \pm 0.5$  v. First  $V_i = 13.3 \pm 0.5$  v. Second  $V_r =$  about 12.2 v. Second  $V_i = 16.51 \pm 0.5$  v. Bohr's theory gives  $V_r$  for H atom = 10.16 and  $V_i$  for H atom 13.54; for H mol.  $V_i = 16.26$ . The difference between these ionization potentials then is: observed,  $3.24 \pm 0.5$  v., calcd. by Bohr 2.72; calcd. from Langmuir's heat of dissociation (*C. A.* 8, 1043) = 3.90 v. The difference between first resonance and second ionization potentials gives a much better check between the observed and calcd. values and the observed values are the most reliable. The resonance potential of N checks a doublet noted by Lyman at 1492.8 and 1494.8 Å. That of O lies in its great absorption band. The possibility of some of these measured ionization potentials being "negative ionization potentials" or the potentials required to remove an electron from a negatively charged ion to form a neutral mol. is con-

sidered. There is no evidence of such formation in the curves obtained. The curves of these non-metallic elements show similarities to those of metallic elements except perhaps the curves for H. F. O. A.

**Radiating and ionization potentials of hydrogen.** K. T. COMPTON AND P. S. OLMSTEAD. *Phys. Rev.* **17**, 45-53(1921).—To detect and distinguish between radiation and ionization, the Lenard method, modified by the introduction of a receiving electrode of variable area was used. Both radiation and ionization were obtained at about 10.8 volts, probable radiation at about 13.4 v., and strong ionization at 15.9 v. These exptl. results are compared with those of other investigators; and as an explanation of apparent discrepancies it is pointed out that the following effects may occur together: radiation from free atoms near 10.8 v. and ionization near 13.5 v.; ionization without dissociation of mols. near 10.8 v., dissociation plus radiation from one of the atoms near 13.4 v. and dissociation plus ionization of one atom near 15.9 v. A. C.

**Note on the explanation of magnetic phenomena in solid bodies.** W. LENZ. *Physik. Z.* **21**, 613-5(1920).—Curie's law ( $XT = \text{const.}$ ) has been observed to hold for solid paramagnetic substances as well as for gases. L. disagrees with Weiss' explanation of this, since the latter assumes that mols. are as mobile in the solid state as in the gaseous, whereas from the knowledge of crystal structure we know that this is not the case. However, as observed by Weiss, pyrrhotite and magnetite show different intensities of magnetization along different axes of the crystals. We must, therefore, conclude that the elementary magnets, while not completely free to turn about their magnetic axes, are able to swing abruptly from one position into another which is at an angle of  $90^\circ$  to the original position in the case of magnetite and  $60^\circ$  in the case of pyrrhotite. Introducing the condition for this into the equations used for detg. the equil. state for the magnets under the combined action of a magnetic field and thermal agitation, L. derives Curie's law. He also suggests that it would be of interest to investigate the magnetic behavior of the above crystals at very low temp.

SAUL DUSHMAN

**Theory of quanta and the magneton.** W. PAULI, JR. *Physik. Z.* **21**, 615-7 (1920).—According to Bohr's theory the magnetic moment per mol. of any substance should be a multiple of the elementary magnetic moment  $\mu_B = hN/(4\pi)$ , where  $h$  is Planck's const.,  $e$ , the charge on an electron, and  $N$ , Loschmidt's number. The numerical value of this is 5584 c. g. s. units, whereas Weiss obtains empirically the value 1123.5 for his "magneton." P. concludes that the latter value has no theoretical or exptl. justification and attempts to account for the observation that in the case of NO and O<sub>2</sub> the magnitudes of the magnetons are 1.8 and 2.8 times, resp., that calcd. on Bohr's theory. According to Langevin's theory of paramagnetism, the magnetic moment per mol. is given by the expression  $\sqrt{3RXT}$  where  $X$  denotes the magnetic susceptibility per mol. In deriving this relation it has, however, been assumed that the axes of the elementary magnets are distributed with equal probability in all directions. If, however, it be assumed that the elementary magnets can be distributed only along certain directions for which the turning moment of the magnet follows some form of quantum relation, it can be shown that the observed value of the magneton will be greater than that calcd. by Bohr's theory. P. shows that by assuming a uni-quantum value for the turning moment of the elementary magnet in the case of NO and a bi-quantum value in the case of O<sub>2</sub>, the calcd. values of the magneton are practically the same as those actually observed.

SAUL DUSHMAN

**Magnetic storms.** S. CHAPMAN. *Phil. Mag.* **40**, 665-70(1920).—Reply to F. A. Lindemann's (*C. A.* **15**, 469, criticism of C.'s (*Proc. Roy. Soc. (London)*, 95A (1918)) theory according to which a stream of corpuscles, mainly or entirely of one charge, projected from the sun and penetrating into the earth's atm., is the cause of magnetic storms. C. concurs with L. that the stream leaving the sun must contain both positive

and negative charges and be approx. neutral electrostatically, to avoid lateral dissipation, but this according to C. will not prevent the arrival at the earth of a stream with predominant charge of one kind. C. also points out reasons for believing that magnetic storms and auroras are produced by negative charges and that there is a negative charge on the earth.

S. C. LIND

**The structure of Röntgen-ray spectra.** W. KOSSEL. *Z. Physik* **1**, 119-34(1920).—A theoretical discussion of the structure of X-ray spectra, both emission and absorption, but particularly the latter, taking into consideration the latest measurements on the M series of the heavier elements by Stenström (*Dissertation*, Univ. Lund, 1919: Exptl. Investigation of Röntgen-Ray Spectra); cf. *C. A.* **13**, 3072. The absorption spectrum of X-rays which appears to be continuous is really made up of very much broadened lines. The author offers a new explanation of the deviation of the lines of the X-ray spectrum from the calcs. based on the author's and Sommerfeld's principle of selection and sees no reason for any serious departure from the *Bohr atomic model*.

C. S. BRAININ

**Remarks on the fine structure of Röntgen-ray spectra.** A. SOMMERFELD. *Z. Physik* **1**, 135-46(1920).—A detailed theoretical discussion of the M series in particular, with the purpose of showing that the "principle of selection" formulated by the author and Kossel, can be applied to explain the frequencies of the lines. A fairly satisfactory agreement is found. The paper concludes with a discussion of the limitations of the explanation given by Kossel (cf. preceding abstract) of the differences between observed and calcd. frequencies.

C. S. BRAININ

**Photoelectric conductivity of diamonds.** B. GUDDEN AND R. POHL. *Z. Physik* **3**, 123-9(1920); cf. *C. A.* **14**, 3363.—An optically clear diamond shows a normal photoelec. effect (increase with frequency) in strong elec. fields for wave lengths from 250  $\mu\mu$  to 600  $\mu\mu$ . Impure diamonds, with optical absorption bands show large deviations from the normal curve in the region of the absorption.

F. C. HOYT

**Color sensitiveness of photoelectric cells.** ELEANOR FRANCES SEILER. *Astro-physical J.* **52**, 129-53(1920).—In T. Shinomiya's (*C. A.* **13**, 2483) detn. of the wave length for max. color sensitiveness of photoelectric cells of pure Na, K, and Rb, and of the colloidal modification of the alkali hydrides of these same metals, the  $\lambda_{\max.}$  was not the same for pure metal and hydride but the nature of the shift was not fully detd. This investigation was (1) to obtain exptl. data on the direction and amt. of shift in  $\lambda_{\max.}$ ; (2) to complete the study of color sensitivity for the whole group of alkali metals; and (3) to furnish data for theoretical purposes in the application of the quantum theory to chemistry. Color sensitiveness curves were obtained for 30 photoelec. cells, including all the alkali metals and hydrides of Na, K, Rb, and Cs. The curves were accurately detd., the *wave lengths of maximum sensitiveness* being located within about 1  $\mu\mu$ . It was found that as the at. wt. of the alkali metal increases, the max. sensitiveness decreases, the resonance peak becomes broader, and  $\lambda_{\max.}$  shifts toward the red. These changes may be associated with the increase in at. vol. For glass cells filled with argon at low pressure,  $\lambda_{\max.}$  was 405, 419, 440, 473, and 539  $\mu\mu$  for Li, Na, K, Rb, and Cs, resp., while for the corresponding hydrides NaH, KH, RbH, and CsH, the values were larger: 427, 546, 481, and 540  $\mu\mu$ , resp. With Ne instead of A, in the case of NaH and KH,  $\lambda_{\max.}$  was about 20  $\mu\mu$  shorter. And while, in the case of KH, pyrex cells gave the same curve as glass ones, quartz cells showed a longer  $\lambda_{\max.}$  for both KH and RbH, contrary to what would be expected from differences in absorption. Since the effects of gas and of cell wall were not eliminated and the normal and selective photoelec. effects were not differentiated, the curves are characteristic of the particular cells rather than of the various metals alone; nevertheless the products of  $\lambda_{\max.}$  with (1) resonance potential; (2) ionization potential, and (3) abs. melting temp. of the corresponding metals are each roughly const. The hydride

cells were somewhat more sensitive than the corresponding metal cells. Cells of K and KH were exposed for hundreds of hours but no fatigue effect could be detected. The prepn. of a Li photoelec. cell is described. It was found possible to dissolve Li in ethylamine if absolutely dry and if a trace of ammonia was present. A uniformly distributed layer of Li was obtained by evapg. the soln. The method of prepg. pure *ethylamine* is described.

W. F. MEGGERS

**The structure of the Balmer series.** E. GEHRCKE AND E. LAU. *Physik. Z.* **21**, 634-5(1920).—Only the  $H\alpha$  and  $H\beta$  lines of the Balmer series have been resolved into doublets, in previous work. The authors ascribe this to the use of a capillary form of spectrum tube. They use instead a tube over 80 cm. long and 10 mm. wide, with no capillary. It is filled with hydrogen prepd. from  $H_2SO_4$  and pure Zn. (The pressure in the tube is not mentioned.) A. c. excitation (4800 volts) is employed and the lines are observed with a Lummer-Gehrcke plate 4.63 mm. thick and 13 cm. long. Enlarged photographs of  $H\alpha$ ,  $H\beta$ ,  $H\gamma$ , and  $H\delta$  are reproduced, and these show all four lines as doublets, the sharpness of the resolution decreasing from the first to the last line. The seps. are 0.126 Å. (8.78 v.), 0.0695 Å. (8.82 v.), 0.058 Å. (9.2 v.), and 0.0432 Å. (7.7 v.), resp. The sepn., in terms of frequency, is const. within the limits of exptl. error. The broadening of these lines in a capillary tube is ascribed to the greater intensity of the electric field, and the accompanying Stark effect. R. T. B.

**A method for the identification of the carriers of emission band spectra.** A. REIS. *Physik. Z.* **21**, 601-2(1920).—Mixed and divided flames are used as a source of emission for the identification of the carriers of band spectra. The so-called "water-vapor spectrum" in the ultraviolet is investigated by means of a CO flame, burning in a mixt. of air and  $O_2$ . Using a const. high temp. (dtd. by radiation pyrometry) and a uniform flame, whose chem. compn. is accurately analyzed, the intensity of the spectrum in question is found, at low concn. of  $O_2$ , roughly proportional to this concn. At higher concns. the intensity practically reaches a max. The intensity is not related in any way to the  $H_2O$  content, and therefore this spectrum cannot be due to water vapor. The form of procedure is valuable inasmuch as it is founded on the certain methods of chem. analysis.

R. T. BURGE

**The absorption spectrum of europium.** WILHELM PRANDTL. *Ber.* **53**, 1726-8 (1920).—While purifying Sm, a characteristic absorption line of wave length  $\lambda = 570\mu\mu$  was observed. This line is not described in absorption spectra of the rare earths but upon subsequent isolation of Eu it was found to represent a line to which Demarcay, the discoverer of Eu, ascribed the wave length 570. This divergence and the fact that no observations except Demarcay's exist for the absorption spectrum of Eu led to its further investigation. The method of purifying Eu is described and the absorption spectrum is found to consist of bands with wave length limits 593.5-588.9, 579.0, 537.5-533.5, 525.9-525.3, 465.6-465.3, 465.0-464.7, 464.6-464.3, 399.3-392.6, 386.7-384.1, 381.5-379.7. The visible absorption spectrum of Eu is relatively weak, but very simple and characteristic because of its sharp lines; perhaps it will be the first to play a role in the theoretical meaning of the absorption spectra of rare earths.

W. F. MEGGERS

**Regularities in the spectrum of neon.** W. GROTRIAN. *Physik. Z.* **21**, 632-43 (1920).—The author makes use of Paschen's analysis of the Ne spectrum (*C. A.* **15**, 341) and gives a graphical representation of all the series' lines. This method of representing spectral relations has recently come into general use. It consists of plotting, as short vertical lines, the frequency value of the various "terms" that make up the several series' sequences, while an emitted spectral line is represented by a sloping or horizontal connecting line. Not all of the possible series have been observed, i. e., only 30 out of 40 possible principal series; only 29 out of 40 possible second subordinate series, etc. An analysis of the missing series (in the light of Bohr's "Auswahl-

prinzip") reveals a number of striking regularities. The various series can be grouped in classes having the same number of "missing" series, the same form of series equation, and, apparently, the same Zeeman effect, although data on this latter point are very fragmentary.

R. T. BROS

A new method for the production of spectral lines, by means of radiation (fluorescence). CHR. FÜCHTBAUER. *Physik. Z.* 21, 635-8(1920).—By illuminating Hg vapor, at low pressure, with the light emitted by electrically stimulated Hg vapor, only the resonance lines 2537 and 1849 (the first lines of the two absorption series) have thus far been obtained. The author, by using *very strong* illumination, obtains the other strong Hg lines belonging to the single and triplet series (but *not* the spark lines, which form the "enhanced" doublet series). A quartz tube *c* contains Hg vapor, excited by a current of 10-12 amp. A portion of this tube is in the form of a ring, entirely surrounding another pencil-shaped quartz tube *d*. The vapor pressure in *d* is varied by changing the temp. and the radiation from *d* is viewed axially. It is proved that the line 2537, emitted by *c*, is alone responsible for the radiation from *d*. The results form a striking confirmation of Bohr's theory, as the author explains in detail, by means of a diagram and description. An exposure of only 15 sec. is necessary to obtain all the strong mercury lines. Their intensity is a maximum for a 10-amp. current in *c*. This also is explained theoretically. This new method of obtaining "fluorescent" lines, as well as "resonance" lines, is suggested as a means for distinguishing different classes of carriers of spectral lines, for the production of unusually sharp lines, and for observation of the Stark effect.

R. T. BROS

Actions due to "discontinuous heredity" and spectral lines. MARCEL BRILLOUIN. *Compt. rend.* 171, 1000-2(1920).—In continuation of previous work (*C. A.* 13, 2807), B. assumes that the wave originated by a moving electron is propagated, in the region close to the at. nucleus, with a variable velocity, in contrast to the previously assumed const. velocity. It is further assumed, as one limiting case, that the velocity is a function only of the distance from the nucleus. Mathematical analysis then shows that, within certain limits, it is possible to assume any function and also to satisfy any one spectral law, such as Balmer's. It is then possible to compute the various physically possible electronic orbits resulting from the assumed law. The converse process is not possible since there result integral equations of a form not yet studied.

R. T. BROS

The effect of concentration on the spectra of luminous gases. T. R. MERTON. *Proc. Roy. Soc. (London)* 98A, 255-60(1920).—More than 40 years ago Lockyer observed that in the spectra of elec. spark discharges in mixts. of N and O, the N lines were narrow and the O lines broad when the O was present in excess, and in the same way the O lines were narrow and the N lines broad when the N was in excess. Similar phenomena are common in the spectra of mixed gases or vapors, but have never been explained. Rayleigh (*C. A.* 9, 1872) suggested that the cause of line broadening "might be of a quasi-chemical character, *e. g.*, temporary associations of atoms." It would be expected that the addition of a large quantity of Li to a source containing Na would result in a broadening of the Na lines. Merton tested this in the case of flames and with arc spectra *in vacuo* but in neither case could any change be detected, and these expts. seem to exclude temporary associations of atoms as the explanation of the phenomena. All the evidence points to a specific influence of atoms of the same kind on one another. A study of the broadening of the He and H lines in spectrum tubes containing these gases in varying proportions, shows that there is a specific action of charged atoms of the same kind on one another, and that the elec. resolution into components which is produced by a neighboring charged atom of the same kind is *vastly* greater than that produced by an atom of another kind. It is pointed out that when the relative intensities of lines in a mixt. of 2 gases is altered by the inclusion of a

condenser or spark gap in the elec. circuit, the ultimate cause may sometimes be found in the alteration of the relative proportions of the gases in the capillary of the discharge tube.

W. F. MEGGERS

**Transmission and refraction data on standard lens and prism material with special reference to infra-red spectroradiometry.** W. W. COBLENTZ. Bur. Standards, *Sci. Papers* No. 401, 701-14(1920); *J. Optical Soc. Am.* 4, 432-47(1920).—A brief discussion of spectroradiometry, spectrometer calibration and elimination of scattered radiation in spectral energy measurements followed by a compilation of all the best data on spectral transparency and refractivity of materials useful for prisms and lenses in spectroradiometers. Optical consts. are given for glass,  $\text{CS}_2$ , quartz, fluorite, rock salt, and sylvite. A classified bibliography is added.

W. F. MEGGERS

**Spark spectra of mercury, copper, zinc and thallium in the extreme ultraviolet.** LEON BLOCH AND EUGENE BLOCH. *Compt. rend.* 171, 909-12(1920); cf. *C. A.* 15, 209,340.—The wave lengths of many new lines are given for these metals in the region from about 1400 Å. to 1850 Å.

F. O. A.

**Action of light on silver bromide.** WALTHER EHLERS AND PETER PAUL KOCH. *Z. Physik* 3, 169-74(1920).—When particles of AgBr are suspended between electrified plates, as in Millikan's method of measuring  $e$ , changes of mass are displayed as a continuous change in the voltage required to keep the particle stationary. Changes in charge are discontinuous. When illuminated in an atm. free from O the particles show a marked decrease in mass, but in the presence of O there is a very slight increase, possibly due to the combination of free Ag with O. The decrease in mass is such as would about correspond to a loss of one Br mol. per particle in light sufficient to give a density of 0.6 on a rapid plate.

F. C. HOYT

Dispersion by refraction of hydrocarbons (DARMOIS) 2.

LAUR, M. V.: **Über die Auffindung der Röntgen-strahlinterferenzen.** Karlsruhe: C. F. Müllersche Hofbuchhandlung. M. 2.50. For review see *Z. physik. Chem.* 96, 501(1920).

**Production of radioactive substances by adsorption.** E. EBLER. *Can.* 207,478, Jan. 11, 1921. A soln. containing Ba and Ra chlorides is treated with pptd. hydrated  $\text{MnO}_2$  and the solid products after sepn. of the soln. are treated with hot HCl to dissolve the radioactive substances.

**Treating radioactive ores.** E. EBLER. *Can.* 207,479, Jan. 11, 1921. Mixts. containing radioactive substances are mixed with  $\text{CaH}_2$  and  $\text{CaC}_2$ , the mixt. is caused to react and the resulting material is treated with HCl to recover the radioactive materials.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**Moore rapid "Lectromelt" furnace.** R. D. THOMAS. *J. Am. Inst. Elec. Eng.* 39, 1038-9(1920).—The advantages of the elec. furnace over open-hearth in steel melting are: (1) Neutral heat, (2) more rapid heating without destruction of refractories, (3) greater daily output, a three-ton elec. furnace equals the daily output of a thirty-ton open-hearth, (4) better quality of product, (5) greater heat obtainable and greater fluidity of melt. The special features of the Moore furnace are: Melting is very rapid,  $\frac{1}{2}$  to  $\frac{3}{4}$  hr. per charge, roofs have long life, av. 200 heats; power consumption is low, 350 kw. hr. per ton, the inverted dome bottom holds refractories in place, no mechanism

in pit; conducting arms also support electrodes, thereby lessening deterioration. It is claimed that this furnace has doubled the daily output of the av. elec. furnace of the same capacity.

O. A. HOUGEN

**Greaves-Etchell furnace.** F. W. BROOKE. *J. Am. Inst. Elec. Eng.* **39**, 1036-8 (1920).—An important feature of the Greaves-Etchell furnace is the improved elec. arrangement. The primary of the transformers is connected in delta, secondary in Y. One leg of the secondary is connected to the bottom of the furnace by means of Cu bus bars and Cu plates through a lining of magnesite and dolomite. The other two legs are connected to movable electrodes. The advantages of this arrangement are: Movable electrodes cannot touch the furnace charge without short-circuiting; overloading of one phase is prevented, and high reactance is overcome; the charge of the furnace requires no rabbling, and the roofs have a long life; hot and cold spots are prevented by using a large number of electrodes in multiples of two. O. A. HOUGEN

**Weeks electric furnace.** S. H. OURBACKER. *J. Am. Inst. Elec. Eng.* **39**, 1039-4 (1920).—The Weeks rotating brass furnace is a single-phase arc type with horizontal electrodes; the power factor is 80%. The half-ton size has a rating of 200 kw.; 1 ton size 300 kw.

O. A. HOUGEN

**Operating records of brass furnace pouring directly into molds.** JAMES F. BRUSHER. *Elec. World* **77**, 49-50 (1921).—A 1-ton Detroit rocking elec. brass furnace poured 6 or 7 heats in a 10-hr. day, the energy consumption ranging from 260 kw. hrs. on the first heat to 200 kw. hrs. on the sixth heat as the furnace became hotter with each succeeding heat. The av. time for a heat was  $1\frac{1}{4}$  hrs. Elimination of the ladle has saved the cost of replenishing crucibles. The molds are carried on a truck, operating on rails. The molds are elevated to bring them as close as possible to the furnace spout. The truck is moved back and forth under the furnace spout by a rack and gear controlled by a hand-operated wheel.

LOUIS JORDAN

**Electric steel refined in the ladle.** C. DORNHECKER. *Schweis. Chem.-Ztg.* **1920**, 597.—The duplexing process is briefly referred to, in particular the account in *Foundry*, **47**, 850 (1919) of U. S. pat. 1,318,164 (*C. A.* **14**, 44).

LOUIS JORDAN

**Judge electrolytic zinc plant.** GEO. C. HEIKES. *Eng. Mining J.* **110**, 1118-23 (1920); cf. *C. A.* **14**, 1640.—Ore containing 6-15% Zn, 4-12% Pb, 4-10% Fe, and 4-15 oz. Ag per ton, is concd. (wet gravity) and yields a Pb concentrate (to smelter), and a Zn concentrate containing about 38% Zn, 3-5% Pb, 30% S, 8% Fe, 30 oz. Ag per ton along with 0.2% Mn and small quantities of Sb, Cu, Cd, As. This is roasted in a Wedge roaster at 700°. The calcine is then charged into Pachuca tanks and is leached with electrolyte of the proper acid concn. The calcine lowers the acidity to 1.5 g. per liter. After neutralizing with lime,  $\text{FeSO}_4$  soln. is added to bring the Fe up to 0.3 g. per l., and sometimes  $\text{MnO}_2$  is added to insure a ferric state. The lime causes the Fe to ppt. and As and Sb are carried along with the Fe. The leaching requires 3 hrs. The pulp from the leaching tanks is sent through a set of Dorr classifiers and Oliver and American filters, giving soln., sand and slimes. The two latter are sent to the smelter, as they carry 20 oz. Ag per ton, 10-20% Zn, and 8% Pb. Overflow from the Dorr classifiers is purified by agitation with Zn dust in a Pachuca tank. This ppts. out the Cu and Cd and after passing through Sweetland filters, yields nearly pure  $\text{ZnSO}_4$  soln. for electrolysis. Filter cake from the presses contains 30-50% Zn, 4-7% Cu, 3-6% Cd, and is stored for future treatment. Effort is made to hold the feed soln. for electrolysis at 60 g. Zn per l. and with a max. of 0.002 g. per l. of any impurity. Two series circuits of 60 cells each are used, and cells are grouped in cascades of 5. Redwood cells,  $4\frac{1}{2}' \times 3'$  deep  $\times 7'$  long are used. Pb coils are used to water-cool the electrolyte. The overflow contains 20 g. Zn per l. Cells contain 19 Pb anodes and 18 cathodes connected in parallel on 2 in. centers. Electrolytic surfaces are  $2' \times 3'$ , av. volts = 3.5, c. d. = 20 amp. per sq. ft. Al starting sheets



$\frac{1}{8}$  in. thick are used, from which a  $\frac{1}{8}$  Zn plating is stripped every 24 hrs. for melting. Ingots are 99.93% pure. Capacity at present = 7-9 tons per day. C. H. E.

**Production of electrolytic cadmium.** H. R. HANLEY. *Chem. Met. Eng.* **23**, 1257-64(1920).—Cd is recovered electrolytically from the bag-house condensation product of Cu and Pb furnaces, which assays approx. Cd 0.6%, Zn 19, As 6.6%, with some Cu, Au, Ag, Bi, Pb, and Te, Se, Co, Ni, Tl. These are leached out with  $H_2SO_4$  and powdered  $CaCO_3$  is added to ppt. out Fe, As, and 40% of the Cu. By adding Zn dust a mud is formed of Cu 25%, Cd 25, and Zn 30. This wet ppt. is leached at 60° with 20%  $H_2SO_4$ ; if any As is present special measures are used for exit of fumes, and  $FeSO_4$  is next added to carry down all As. After neutralizing with  $CaCO_3$  and  $Ca(OH)_2$ , the Cu is filtered out and recovered as blister. All Cd is now pptd. as voluminous sponge by Zn sheets, and resultant  $ZnSO_4$  soln. (120 g. per l.) is electrolyzed in Zn plant. The Cd sponge is dissolved at 60° in spent acid electrolyte, to about 100 g. Cd and 10 g. acid per l. Tl is kept below 0.4 g. per l. by pptn. with  $Na_2Cr_2O_7$ . Rotating cathodes (as developed for Zn) are used in electrolysis to ensure smooth dense deposits. These are  $\frac{3}{16}$ "  $\times$  4' Al disks. Purity of the soln. except for Zn (up to 20% of Cd) is essential. A c. d. of 15 amp. per sq. ft. is max. for smooth deposit, and yield 85% efficiency for the 24-30 hr. depletion. The av. potential difference is 4 v., and 1.27 kw. hrs. are used per lb. of Cd. Cell lining must be shorted to anodes to prevent current losses. Cathodes are melted under heavy oil to avoid oxidation, and the  $\frac{3}{8} \times 12$ -in. sticks for commerce are poured from under clean caustic slag. Losses may be 7-10%, but are mostly recovered from the oxide dross. An increased production, up to 200,000 lbs. (1917), was caused by demands for fusible plugs, bearing metals, solders, and pigments. F. H. HOTCHKISS

**Electrolytic preparation of sodium permanganate.** C. O. HENKE AND O. W. BROWN. *Univ. Ind. J. Phys. Chem.* **24**, 808-16(1920).—Solns. of NaOH of varying concn. were electrolyzed between a Mn anode (92% Mn) and a Pt cathode. Mn goes into soln. largely as the permanganate at concns. up to 75 g. of NaOH per l. and as manganate at higher concns. The highest current efficiency was 38% at the lowest concn. tried, 10 g. per l. when the current d. was 13 amp. per sq. decimeter and the temp. was 8°. The current efficiency decreases with rise in temp. All expts. were carried out with excess of  $Ca(OH)_2$  in the electrolysis vessel. The  $Ca(OH)_2$  forms a film around the cathode thus preventing reduction and deposition of Mn and oxides. The higher the valence at which the metal goes into soln. the higher the discharge potential. C. R. PARK

**Metal plating.** VII. W. G. KNOX. *Metal Ind.* **18**, 556-7(1920); cf. C. A. **14**, 3198.—*Cadmium plating:* a plating on Fe successfully resists rust. The chief solns. are the sulfate, perchlorate, fluoride, fluosilicate, fluoborate, and the cyanide. For the latter use 8 g. Cd as cyanide, 1-18 g. KCN in 200 cc.  $H_2O$ . Current d. = 5-20 amp. per sq. ft. A table is given to show the thickness of deposit per unit of time at various c. ds. VIII, *Ibid* **19**, 25-7(1921).—*Ag plating* is discussed, the Ag voltmeter is explained, and a table is given to show thickness of deposit per unit of time at various c. ds. CHAS. H. ELDRIDGE

**Cleaning for electroplating.** J. H. RICHARDS. *Metal Ind.* **18**, 518(1920).—This is a general discussion of the cleaning problem. Chief requirements of a cleaning agent are, (a) ability to ppt. dirt from soln., (b) ability to remove mineral oils and grease, (c) speed and economy, (d) simplicity in handling and harmlessness to operator's hands, (e) not too great activity in attacking Sn, solder, or die metal. A hot water dip and frequent prepn. of new solns. are recommended. CHAS. H. ELDRIDGE

**Experimental electroplating.** F. H. SWEEER. *Metal Ind.* **18**, 559-60(1920).—A description is given of methods and app. employed in plating by the amateur. A brief outline of the fundamental principles is given in non-technical language. C. H. E.

**Plating of sheet zinc.** CHAS. H. PROCTOR. *Metal Ind.* 18, 495-7(1920).—Sheet Zn may successfully be plated with Ni, Cu, Ag, Au, brass and bronze. In polishing care must be taken not to overheat, so as to avoid expansion blisters. Only milder alkalis should be used in cleaning. A preliminary brass plating is recommended before plating with other metals. Formulas are given for the various baths. Ordinary Ni solns. do not deposit Ni fast enough on Zn, and so, to avoid blisters or black streaks, the following bath is recommended:  $\text{H}_2\text{O}$  1 gal., 8 oz. double Ni salts, 4 oz.  $\text{NaCl}$ ,  $\frac{1}{2}$  oz. citric acid. Use 20 amp. per sq. ft. and 2 volts. CHAS. H. ELDRIDGE.

Some applications of the photoelectric (selenium) cell to practical photometry. W. E. STORY, JR. *Trans. Ill. Eng. Soc.* 15, 827-47(1920).—Certain characteristics of the photoelec. cell that would render it unfit for some purposes seem to have prevented its application in the field in which it would offer obvious advantages over the ordinary photometer. The photoelec. cell seems capable of easy adaptation to measuring the c. p. of incandescent lamps in factories. Diagrams of arrangements for this purpose are shown and discussed. Diagrams and curves are given showing the application of the photoelec. cell to the selection of condenser systems for use in motion picture projection. Some of the obvious advantages of the photoelec. cell are: (1) Freedom from the personal judgment of the operator. (2) Flexibility of sensitivity over a considerable range by changes in the applied potential. (3) Possibility of controlling accurately large quantities of energy through the operation of relays by the amplified cell current. (4) Automatic registering of changes of illumination with change of some other quantity, such as distance, area, shape, etc.; and even time and potential under certain conditions. (5) Comparison of lamps without necessity of a constant potential. The most important limitations of the cell are: (1) A gradual and as yet not wholly explained change of sensitivity with time. (2) A color sensitivity differing markedly from that of the eye. (3) The difficulties of insulation always met with in dealing with very small elec. currents. In the discussion of this paper it is brought out that the study of motion picture condenser systems by the photoelec. cell is not affected by the color sensitivity characteristics of the cell, that preliminary tests of lamps at one factory have shown a range of from 2.0 to 0.6 w. p. c. in the efficiency of lamps before the error due to color difference became greater than the error of the optical photometer then in use, and that the trouble due to leakage of current along insulators, though particularly bothersome in warm weather, can be easily taken care of under almost any surroundings. The cell used was made according to the procedure of Kunz.

D. MACRAE

**Novel electrical precipitator.** ANON. *Chem. Met. Eng.* 23, 1244(1920).—This installation in connection with a battery of 32 McDougall roasters consists of a short flue in which corrugated Fe sheets are hung from the roof and set parallel to the flue walls to act as collecting electrodes. Discharge electrodes consist of gridirons of small Fe pipe placed horizontally and suspended from supporting beams. The dusty gas passes through the electrified zone on its direct route from dust chamber to stack, and selective action on the smoke causes the first hoppers to collect material high in Cu and those near the end to collect dust rich enough in Pb to be sent to the Pb blast furnace. Butterfly dampers control the gas distribution at both ends of the flue; between are four sets of collecting electrodes extending from the top of flue to top of hopper. Between sets is left sufficient open flue to accommodate the discharge electrode suspension. A short length of wrought-Fe pipe is slipped over an I-beam and this assembly passes the sheet-Fe wall through a porthole framed with a ring of 2" pipe with minimum clearance. This latter prevents large ingress of outside air; it protects the insulator from dust accumulations and the treater from a continual influx of cold air. Not more than 125 kv. a. is needed to catch 8 to 9 tons (7280-8190 kg.) of dust daily.

W. H. BOYNTON

**Maximum temperature allowable for insulation.** ANON. *Elec. World* **77**, 154 (1921).—Tests for heating should be made at the rated voltage, frequency, and load for which the app. is rated under conditions equiv. to operating conditions. The three methods are: detn. of the temp by Hg or EtOH thermometers; by resistance thermometers, and by thermocouples or resistance temp. detectors applied to the hottest accessible parts. Tables give the permissible temps. and hottest spot corrections for insulating materials of different classes, also the temp coeffs. for Cu.

W. H. BOYNTON

**Asbestos and its uses in modern electrical practices.** R. L. GREGORY. *Asbestos* **2**, No. 2 (August 1920).—G. classifies asbestos according to application as: wire and cable insulation; insulating supports; coil and slot insulation for motors and generators; insulators in slabs, sheets and as arc deflectors; molded insulation; and filling compds. such as paints and varnishes. Asbestos tape is used in winding coils of all sorts.

W. H. BOYNTON

**Fusing current of copper and Climax wire in air.** P. P. ASHWORTH. *Elec. World* **77**, 261-2(1921).—A. submits a table of fusing currents based on expts. by Preece. A few of the values are: For Cu, diam. 0.325 inch, 1,895 amp.; 0.128, 470 amp.; 0.051, 120 amp.; 0.020, 30 amp.; 0.008, 7.3 amp. For Climax wire, 0.0159 in., 6.5 amp.; 0.010, 3.3 amp.

C. G. F.

**Formula for calculating alternating-current voltage drop.** CHS. E. WARSAW. *Elec. World* **77**, 263(1921).

C. G. F.

Electrolytic high-current and pole tester (PINOFF) **1**. Catalytic action of the metals belonging to the platinum group (HAAS) **2**. Notes on nickel (MERRICA) **9**. Varnish for electrodes of electrolytic cells (U. S. pat. 1,364,359) **26**. Alloying or coating aluminium with other metals (for storage battery grids) (U. S. pat. 1,362,739) **9**.

HAWKES, C. J.: **Storage Batteries.** Minneapolis: Wm. Hood, Dunwoody Industrial Inst. 157 pp. Many illustrs. Chicago: Elec. Rev. Pub. Co. \$2.00. For review see *Elec. Rev.* **78**, 194(1921).

LUCIUS C. DUNN: **Storage Battery Manual.** U. S. Naval Inst., Annapolis. 391 pp., 146 illus. Elec. Rev. Pub. Co., Chicago. \$7.00. For review see *Elec. Rev.* **78**, 194(1921).

**Storage battery.** C. F. HAUNZ. U. S. 1,363,729, Dec. 28. Structural features.

**Storage batteries.** A. H. SNYDER. U. S. 1,363,683-4-5-6, Dec. 28. Structural features.

**Storage battery.** M. E. PIPKIN. U. S. 1,363,671, Dec. 28. Structural features.

**Storage battery.** I. M. NOBLE and W. E. GOSSLING. U. S. 1,364,299, Jan. 4. Structural features.

**Storage batteries.** W. S. GOULD. U. S. 1,363,645-6, Dec. 28. Structural features.

**Storage batteries.** A. S. HUBBARD. U. S. 1,363,648-9-50, Dec. 28. Structural features.

**Accumulators.** HENRY LEITNER and WM. H. EXLEY. Can. 207,784, Jan. 25, 1921. A plate or element for accumulators comprizes a non-conducting support of porous wood, furnished with grooves sepd. by solid portions of the support, in which are mounted metal conductors connected to a terminal and covered with active material.

**Accumulators.** H. LEITNER and WM. H. EXLEY. Can. 207,783, Jan. 25, 1921. A plate for an accumulator has a support which consists of a series of strips of porous wood with grooves between them. The grooves contain active material with con-

ductors embedded in it. The end pieces of the plate have notches engaging the strips of porous wood.

**Storage-battery separator plates.** G. W. PLEIS. U. S. 1,362,737, Dec. 21. Structural features.

**Wood separator for storage batteries.** G. H. RABENALT. U. S. 1,363,754, Dec. 28. Wood containing its natural moisture content but freed from some of its natural constituents (such as cedar extd. with NaOH soln.) is used for the manuf. of separators for storage batteries.

**Storage battery grid.** M. O. SMITH. U. S. 1,364,011, Dec. 28. Structural features.

**Storage battery grid.** W. E. HOLLAND and J. M. SKINNER. U. S. 1,364,760, Jan. 4. Structural features.

**Electrode for arc welding.** P. H. BRACE. U. S. 1,363,636, Dec. 28. Electrodes are formed with an outer sheath of welding metal such as Fe enclosing a core of an alk. earth metal, *e. g.*, Ca or Mg, or Al or a carbide, which serves as a deoxidizing agent.

**Electroplating steel to protect it from corrosion.** J. S. GROFF. U. S. 1,364,051, Dec. 28. Steel to be electroplated is made the cathode in an electrolyte of Pb fluoroborate with an anode of Pb and Sn. The electrolytic deposition is continued until the Pb and Sn in the electrolyte are substantially in the same relative proportions as in the anode.

**Preparing zinc solutions for electrolysis.** F. PETERSSON. U. S. 1,363,052, Dec. 21. Sol. silica is removed from Zn solns. such as  $ZnSO_4$  soln. from ores, to prep. them for electrolysis, by treating the soln. with an excess of  $CaCO_3$  or other basic neutralizing agent at a temp. near  $100^\circ$ .

**Apparatus for electrolytic deposition of metals.** M. M. MERRITT. U. S. 1,363,186, Dec. 21.

**Electrolytic cell adapted for making chlorine and sodium hydroxide from sodium chloride solutions.** F. H. BUCK and P. McRAE. U. S. 1,363,228, Dec. 28. Structural features.

**Apparatus for the production of calcium cyanide by the reaction of nitrogen on calcium carbide.** A. DUCHEMIN. U. S. 1,363,096, Dec. 21. The N is forced through the carbide under pressure.

**Furnace for nitrifying carbides.** V. THRANE. U. S. 1,364,157, Jan. 4. Carbide is spread upon a layer of inert material on the surface of a rotatable table within an annular furnace and treated with N counter current wise.

**Insulating metallic layers.** J. J. ZWERLING. U. S. 1,363,074, Dec. 21. Layers of metal such as parts of elec. heating devices (*e. g.*, irons) are insulated from each other by a coating of Na silicate soln. carrying inert material such as  $SiO_2$  or carborundum in suspension when applied and to which is added, after its placement on the metal, additional inert material such as  $SiO_2$  in granular form.

**Incandescent lamp filaments.** R. E. MYERS and R. D. HALL. U. S. 1,363,162, Dec. 21. W filaments which tend to "offset" in use are made with a content of about 5% or less of a plurality of oxides selected from oxides of the alkali metals, alk. earth metals, Be, Al and Ti, which serve to prevent "offsetting."

**Electric incandescent lamps.** F. HARRISON. Brit. 152,379, May 13, 1919. Deposit on the inside of bulbs is removed, when renewing filaments, by  $H_2O_2$ , introduced through an aperture made at the nip. The bulb is then washed, first with  $H_2O$ , and afterwards with alc.,  $Et_2O$  or the like; it is then suspended in a rack with the aperture downwards for 24 hrs. to dry. Cf. 12,054, 1913, 114,464, 152,058, 152,377, and 152,378.

**Filaments.** G. R. FONDA. Can. 207,214, Jan. 4, 1921. A filament composed of W and up to 1% of Fe having a stable fine-grained cryst. structure, effectively resists offsetting.

## 5—PHOTOGRAPHY

LOUIS DERR

**Reduction of sodium silver thiosulfate with hyposulfite.** I. A. STRIGMANN. *Kolloid-Z.* 27, 249-54(1920).—Various colored deposits, sometimes metallic, often appear on developing latent images in complex Ag salts primary-fixed with  $\text{Na}_2\text{S}_2\text{O}_4$ . Test-tube expts. show that the colloidal Ag initially formed speedily becomes reddish blue, but in the presence of soda the sol remains yellow to yellow-brown up to the coagulation point. KI acts as a catalyzer; the action on the ripening of Ag seems to be that AgI is temporarily formed, yielding on reduction dominating foci which carry the color to red-violet; NaCl and KBr exercise a similar but less potent influence. In the absence of halides hyposulfite always produces a yellow-brown Ag, while in "germ-free" sols. most other developers tend to form gray-blue Ag. J. ALEXANDER

**Photochemical investigations of the photographic plate.** R. E. SLADE AND G. I. HIGSON. *Proc. Roy. Soc. (London)* 98A, 154-70(1920); cf. C. A. 14, 699.—The individual Ag grain is found to be the photochemical unit in the photographic plate, and a method is given for investigating the photo-chemical behavior of these grains, free from development errors and other disturbing factors. Plates having only a single layer of Ag halide grains were prepd. and treated, with all the factors controlled and separately variable. A formula is given for the relation between the behavior of the grains, the light intensity, and the time of exposure. The experimental results show that it is impossible for the mechanism of the process to be the absorption of light in discrete quanta, and that a given amt. of light energy has a greater photographic effect when concd. into a short range of wave lengths than when distributed over a large range.

L. DERR

**New theory of photographic phenomena.** A. DAUVILLIER. *Compt. rend.* 171, 717-9(1920).—In the Ag halide grain, the impact of  $\beta$ -,  $\gamma$ -, or X-rays or ultraviolet light causes the formation of Ag which constitutes the latent image, while the Cl or Br also remains in the film, and recombination is possible in certain conditions. The ordinary photographic impression is of the same nature. The chem. action of the rays enumerated may reach an equilibrium, with the electropositive atoms remaining exposed to the rays; but the work of ionizing these atoms is much less than that required to destroy the negative ions. Light of short wave length is almost wholly absorbed by the electropositive elements, and the resulting photoelectric effect thus destroys the initial impression. Reversals produced by  $\beta$ -,  $\gamma$ -, or X-rays are less complete, for with these both the electropositive atoms and the negative ions are affected.

L. DERR

**A photographic research laboratory.** C. E. K. MEES. *J. Roy. Soc. Arts* 68, 695-703(1920).—The organization and work of the research lab. of the Eastman Kodak Co. are described.

E. H.

**Action of light on silver bromide (EHLERS, KOCH) 3.** Incombustible celluloid-like pyroxylin composition (U. S. pat. 1,364,342) 23.

MATTHIES-MASUREN, F.: *Bildmässige Photographie*. 3rd Ed. revized. Halle a.S. Wilhelm Knapp. M. 12, bound M. 15. For review see *Phot. Rundschau* 57, 14(1921).

**Color photography.** P. FAULSTICH. Brit. 152,002, July 12, 1920. Methods are described for producing multicolor grain screens in which the colors are produced partly by spraying a base with colored dyestuffs and partly by immersing the film in other dyestuff baths. The immersion treatment may affect the parts already colored by spraying or the sprayed colors may be utilized as a resist and subsequent to immersion in another colored bath be washed away and all the colors produced by such successive treatments.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

**Reactions of nitrites with weak bases.** K. A. HOFMANN AND GUSTAV BUHK. *Ber.* 53, 2165-71 (1920).—If 15 g.  $\text{NaNO}_2$  and 30 g.  $(\text{NH}_4)\text{HCO}_3$  are dissolved in 250 cc. water in the presence of Cu, a reaction occurs readily at ordinary temps., the gas first consisting of almost pure  $\text{N}_2\text{O}$ , later of  $\text{N}_2\text{O}$  and  $\text{N}_2$  in the ratio of approx. 1:2. This reaction must depend upon the presence of  $\text{NH}_4\text{NO}_2$ . If  $\text{NH}_4\text{Cl}$  and  $(\text{NH}_4)_2\text{SO}_4$  are used, the same reaction occurs, and the formation of  $\text{N}_2\text{O}$  must be ascribed to the splitting off of  $\text{HNO}_2$  from the  $\text{NH}_4\text{NO}_2$  by hydrolysis, and the reduction of the acid by Cu and the cupro salts. The fact that the use of two mols. of  $\text{NH}_4\text{Cl}$  to one of  $\text{NaNO}_2$  increases the amt. of  $\text{N}_2\text{O}$ , and that with increasing alkalinity, as the reaction proceeds, the evolution of gas ceases, bespeaks the correctness of this reasoning. We may consider the reaction therefore in the system  $\text{NaNO}_2$ ,  $\text{NH}_4$  salt, copper, and water, to be a reduction of the hydrolytic  $\text{HNO}_2$  by Cu, with the formation of NO and cupri-ammine salt. The NO is then reduced to  $\text{N}_2\text{O}$  by the cupri-ammine. The use of magnesium salts, in place of ammonium, though much slower in reaction, due to their smaller degree of hydrolysis, confirms the preceding reactions. R. E. HALL

Hypophosphorous acid—its reaction with iodine (MITCHELL) 2.

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

**Microanalytical methods.** B. J. HOWARD. *J. Assoc. Off. Agr. Chem.* 4, 60-3 (1920).—A report, in which the various errors entering into quant. microanalytical methods are enumerated and the need of establishing suitable standards, requiring research, is pointed out. S. G. SIMPSON

**Chemical analyses with membrane filters.** K. BRAUER. *Chem.-Ztg.* 44, 884 (1920).—The use of membrane filters is claimed to be of little value in hastening analytical filtrations. The article is followed by discussions from other analysts who hold the opposite opinion. S. G. SIMPSON

**Representation of analytical results.** P. BEYERSDORFER. *Chem.-Ztg.* 44, 884 (1920). S. G. SIMPSON

**Notes on the normalities of standard solutions.** YUKICHI OSAKA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 113-25 (1920).—See C. A. 14, 159. W. T. H.

**The standardization of alkalimetric solutions.** FRANK L. LE MOTTE. *Cotton Oil Press* 4, No. 7, 52-3 (1920).—A discussion of the merits of various substances suggested as basic standards for alkalimetric solns. is followed by a description of the properties and use of K acid phthalate in standardizing alk. solns. H. S. BAILEY

**The electro-titration of hydriodic acid and its use as a standard in oxidimetry.** W. S. HENDRIXSON. *J. Am. Chem. Soc.* 43, 14-23 (1921).—Iodide can be titrated accurately with  $\text{KMnO}_4$  when the end point is detd. electrometrically.  $\text{Cl}^-$  and  $\text{Br}^-$

decrease and delay the sudden rise in voltage, but  $\text{Cl}^-$  is permissible if the quantity present is not more than equivalent to the  $\text{I}^-$  and 0.25 equiv. of  $\text{Br}^-$  is permissible. Dichromate and iodate in 0.02 and 0.05 *N* solns. may be titrated electrometrically by adding to either an excess of  $\text{I}^-$  in  $\text{H}_2\text{SO}_4$  and titrating the excess with  $\text{MnO}_4^-$ . Ag can be detd. similarly. A simple potentiometer suitable for this work is described.

W. T. H.

**Trivalent titanium. I. Notes on the volumetric determination of iron by means of titanous salts.** WILLIAM M. THORNTON, JR., AND JAMES E. CHAPMAN. *J. Am. Chem. Soc.* 43, 91-102(1921).—The method of Knecht and Hibbert for the estn. of Fe is rapid and accurate and deserves better recognition in this country.  $\text{Ti}_2(\text{SO}_4)_3$  may be used just as well as the chloride. The paper describes in detail the method of working with the reagent and cites results from actual analytical practice.

W. T. H.

**The use of gallium ferrocyanide in analysis.** LYMAN E. PORTER AND PHILIP E. BROWNING. *J. Am. Chem. Soc.* 43, 111-4(1921).—Ga may be pptd. as  $\text{Ga}_3[\text{Fe}(\text{CN})_6]_3$  and thus sepd. from many elements. The ppt. upon being ignited is changed to  $\text{Ga}_2\text{O}_3$  and  $\text{Fe}_2\text{O}_3$  in which form it can be weighed. Owing to the gelatinous nature of the ppt. it is hard to filter. In this paper a method of handling the ppt. with suction is described and methods for recovering the Ga from the ferrocyanide ppt. are described, in which alkali and  $\text{CO}_2$ ,  $\text{NaOH}$  or  $\text{H}_2\text{O}_2$  and  $\text{NH}_4\text{Cl}$  are used. W. T. H.

**The qualitative separation and detection of uranium, vanadium and chromium when present together.** PHILIP E. BROWNING. *J. Am. Chem. Soc.* 43, 114-5(1921).—The soln. of the alkali salts is made barely alkaline with  $\text{NH}_4\text{OH}$  and the U is pptd. as phosphate and identified by the ferrocyanide reaction. The chromate and vanadate are reduced by  $\text{SO}_2$  and the V oxidized back by Br. The Cr is pptd. by  $\text{NH}_4\text{OH}$  and the V detected by the formation of pink or violet oxysulfide with  $\text{H}_2\text{S}$  in the filtrate.

W. T. H.

**Notes on the fluoride method for copper.** F. C. GRUBB. *Australasian Chem. Met.* 3, 14-5(1920).—Dissolve the ore in aqua regia and evap. with 3 cc. of  $\text{H}_2\text{SO}_4$ . Add 25 cc. water, 1 cc.  $\text{AcOH}$  and enough  $\text{AcONa}$  to make the soln. red owing to the formation of colloidal, basic Fe acetate. Then add concd.  $\text{NaF}$  soln. until the red color disappears or there is no further change in color, cool, add KI and titrate with  $\text{Na}_2\text{S}_2\text{O}_3$ . No filtration is made and the Fe is converted into  $\text{Fe}_2\text{F}_6$  which does not react with iodide. Results on 6 ores show remarkable agreement with values obtained by the iodide method when  $\text{SiO}_2$  and  $\text{PbSO}_4$  are filtered off and the Cu is pptd. on Al.

W. T. H.

**Difficulties encountered in the determination of antimony in lead-tin-antimony alloys.** H. W. THIBAUT. *Australasian Chem. Met.* 3, 31(1920).—When the alloy is dissolved in  $\text{H}_2\text{SO}_4$  and  $\text{K}_2\text{SO}_4$ , the  $\text{Sb}^{+++}$  can be titrated with  $\text{KMnO}_4$  but difficulty is encountered with the end point. T. obtains good results by the following procedure. Dissolve 2 g. of metal in 50 cc.  $\text{H}_2\text{SO}_4$  and 5 g.  $\text{K}_2\text{SO}_4$ . When the metal is all dissolved, dil. to 150 cc., cool to room temp. and titrate with  $\text{KMnO}_4$  till a pink color is obtained before the true end point is reached. Add  $\text{HCl}$  drop by drop until the pale pink color disappears and then finish the titration with  $\text{KMnO}_4$ . W. T. H.

**A new volumetric determination of hyposulfites.** R. FORMHAUS. *Chem.-Ztg.* 44, 869(1920).—Methods for the detn. of hyposulfites in common use are mostly either inaccurate or unsuited for technical use. The proposed method makes use of the reaction:  $2\text{K}_4\text{Fe}(\text{CN})_6 + \text{Na}_2\text{S}_2\text{O}_4 \cdot \text{H}_2\text{O} + \text{H}_2\text{O} = 2\text{K}_4\text{NaFe}(\text{CN})_6 + 2\text{H}_2\text{SO}_4$ . In the cold,  $\text{H}_2\text{SO}_4$  has no effect on  $\text{K}_4\text{Fe}(\text{CN})_6$ . A 0.1 *N* soln. of  $\text{K}_4\text{Fe}(\text{CN})_6$  is used and a soln. of  $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$  serves as an outside indicator, the titration being carried to the appearance of a ppt. of Turnbull's blue.

S. G. SIMPSON

**Notes on a colorimetric determination of palladium, on the quantitative estimation in connection with the orthodox method of dry assay for precious metals and on palladium alloys for replacing platinum.** KARI, HRADECKÝ. *Oesterr. Chem.-Ztg.* **23**, 160-3, 167-9(1920).—These final installments of the paper deal with a discussion of the difficulties encountered in the detn. of Pd, with comments on previously published papers and mention of important dental alloys which are now being used instead of Pt. A comprehensive bibliography is given and the chem. compn. of some of the important alloys.

W. T. H.

**The gravimetric determination of bismuth as phosphate and its application in ore analysis.** W. R. SCHOELLER and E. F. WATERHOUSE. *Analyst* **45**, 435-9(1920).—Dissolve the ore by digesting first with HCl and then adding HNO<sub>3</sub>. Evap. nearly to dryness and remove HNO<sub>3</sub> by repeated evapn. with HCl. Remove SiO<sub>2</sub> and insol. material as usual and wash the siliceous residue with HCl (1:10). Add 1 or 2 g. of Fe wire to ppt. Bi, Cu, etc. Filter off the metal sponge and dissolve it in HCl and Br<sub>2</sub>. Dil., ppt. with H<sub>2</sub>S and treat the sulfides with freshly made Na<sub>2</sub>S, adding KCN if Cu is present. Dissolve the washed residue in HNO<sub>3</sub>, evap. off the excess acid and ppt. the Bi as phosphate in a vol. of not over 100 cc. Weigh as BiPO<sub>4</sub>. If Pb is absent omit the treatment with Fe. If Cu and members of the As-Sn group are absent, omit the treatment with Na<sub>2</sub>S.

W. T. H.

**An easy method for identifying tinstone.** AUGUST ZÖLLER. *Chem.-Ztg.* **44**, 797-8(1920).—Place a fragment of the mineral upon a fresh surface of Zn foil and moisten with a drop of HCl. After a few minutes a gray, lustrous film of Zn will deposit if tinstone is present. The native SnO<sub>2</sub> acts as a cathode and causes the deposition of the Zn which was dissolved by the action of the acid upon the metal which acts as anode.

W. T. H.

**Determination of uranium.** R. SCHWARZ. *Helvetica Chim. Acta* **3**, 330-46 (1920).—Of the various reagents proposed for the quant. pptn. of U, HgO is untrustworthy, H<sub>2</sub>O<sub>2</sub> is unsatisfactory, ethylenediamine has no advantages over NH<sub>4</sub>OH and is more expensive; HF and (CO<sub>2</sub>H)<sub>2</sub> are inconvenient owing to the oxidation of uranous salts by atmospheric O. The simplest and most trustworthy precipitants are (NH<sub>4</sub>)<sub>2</sub>S and NH<sub>4</sub>OH. Pptn. with (NH<sub>4</sub>)<sub>2</sub>S (cf. Rose, *Z. anal. Chem.* **1**, 411(1862); Remelè, *ibid.* **4**, 371(1865)) is best made at 80° in the presence of NH<sub>4</sub>Cl (about 3 g. in 150 cc. of a soln. containing 0.3 g. U<sub>3</sub>O<sub>8</sub>); the ppt. always contains some NH<sub>4</sub> uranate, and complete sepn. from the alkali metals requires a re-pptn. Pptn. with NH<sub>4</sub>OH (cf. Zimmermann, *Ann. der Chem.* **199**, 15(1879); Kern, *J. Am. Chem. Soc.* **23**, 685 (1901)): Dil. the soln., containing 0.3-0.4 g. U to 100-150 cc., heat to boiling and add 0.5 cc. concd. HNO<sub>3</sub> to oxidize uranous salts; add 5 g. NH<sub>4</sub>Cl and then 2.5% NH<sub>3</sub> soln. dropwise until the soln. assumes a darker color. Continue the addition of NH<sub>4</sub>OH, stirring after each drop, until the soln. has a faint NH<sub>3</sub> odor, add a few cc. of NH<sub>4</sub>OH, let settle, filter, and wash with NH<sub>4</sub>Cl soln. containing a little NH<sub>4</sub>OH. Owing to the tendency of NH<sub>4</sub> uranate to carry SiO<sub>2</sub> with it, the pptn. should not be made in glass vessels. Ignition of the ppt. from the (NH<sub>4</sub>)<sub>2</sub>S or NH<sub>4</sub>OH procedure to U<sub>3</sub>O<sub>8</sub> (cf. Zimmermann, *Ann.* **232**, 287(1886)) should be carried out in porcelain crucibles with access of air, since Pt permits diffusion of gases from the flame, causing a partial reduction to UO<sub>2</sub>. Reduction of U<sub>3</sub>O<sub>8</sub> to UO<sub>2</sub> by means of H is not quant. (cf. Kern, *loc. cit.*), owing to the formation of nitride. The pptn. of U as uranyl phosphate in AcOH soln. (Kern) as a means of sepn. from the alkali metals was found to be practically impossible owing to the fineness of the ppt. The volumetric process, based on the soln. of U<sub>3</sub>O<sub>8</sub> in H<sub>2</sub>SO<sub>4</sub> (cf. Boller, *Diss.*, Zürich, 1915) and titration of the uranous sulfate with KMnO<sub>4</sub>, was simplified and gave exact results. This was not true if complete reduction to uranous salts were first attempted (cf. Pulmann, *Z. anorg. Chem.* **37**, 113(1903)). The detn. of U in the presence of Al is most conve-



niently made volumetrically with  $\text{KMnO}_4$ . The pptn. of Al by  $(\text{NH}_4)_2\text{CO}_3$  in presence of  $\text{NH}_4$  salts is not only incomplete but some U is also pptd. S. outlines an involved procedure which gives good results for the sepn. and detn. of Al and U. Contrary to Kern's conclusion, Pisani's method (cf. *Compt. rend.* 52, 106(1861)) for the sepn. of Fe from U by  $(\text{NH}_4)_2\text{CO}_3$  and  $(\text{NH}_4)_2\text{S}$  is very satisfactory. Ditte's method (cf. *Ann. chim.* [5], 12, 139(1879)) for the sepn. of U from Cr salts is inaccurate (cf. Formánek, *Ann.* 257, 111(1890)), as they must first be oxidized to  $\text{CrO}_3$  (best by Br in alk. soln., although Jannasch's  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  method gives exact results). The ppt. of  $\text{Na}_4\text{UO}_6$  obtained in presence of chromate (cf. Gibbs, *Z. anal. Chem.* 12, 310(1873)) always contains uranyl-alkali chromate, and re-pptn. with  $\text{NH}_4\text{OH}$  is necessary to effect a sepn.; the  $\text{SiO}_2$  in the weighed  $\text{U}_3\text{O}_8$  should be detd. by dissolving the latter in  $\text{HNO}_3$ . A redetn. of the dissociation pressure of  $\text{U}_3\text{O}_8$  showed that the results reported by Colani (cf. *Ann. chim.* 12, 76(1907)) are erroneous, and, considered in conjunction with the heat of formation of  $\text{U}_3\text{O}_8$  from  $\text{UO}_2$  (cf. Mixer, *C. A.* 6, 2885) indicates the existence of an intermediate oxide. On igniting  $\text{U}_3\text{O}_8$  in a current of  $\text{CO}_2$  in an elec. furnace at  $1122^\circ$ , a black residue was obtained corresponding approx. with the formula  $\text{U}_2\text{O}_3$ ; on heating  $\text{U}_3\text{O}_8$  in N, traces of nitride were formed. The results of Zimmermann (*loc. cit.*) were vitiated by the use of a Pt crucible over a gas flame, which permitted reduction. Expts. showed that the ignition of  $\text{Cr}_2\text{O}_3$  is best carried out in a Pt crucible, as this avoids any oxidation to Cr chromate (cf. Rothaug, *C. A.* 8, 882).

F. W. SMITHER

**Rapid determination of chlorine in sulfur chlorides used in the manufacture of mustard gas.** G. DEGAASST AND P. DUPUY. *L'industrie chimique* 7, 304-7(1920).—This method depends upon first decomp. the sulfur chloride by concd.  $\text{NaOH}$ , oxidizing the sulfites and sulfides, which form as by-products, by fuming  $\text{HNO}_3$ , then adding a known excess of  $\text{AgNO}_3$  soln., and detg. indirectly the Cl. Thirty to 45 min. is necessary for a detn. *App.* A glass bulb about 15 mm. diam. to be sealed after filling. This bulb is to be put in a 250-cc. flask, which besides a side neck should have a safety tube, a sliding ramrod to break the bulb, and a funnel with stopcock for the fuming  $\text{HNO}_3$ . The side neck leads to a 1000-cc. flask containing excess  $\text{AgNO}_3$  soln. From this second flask a tube leads to a series of Cloez absorption bulbs containing  $\text{AgNO}_3$  soln. *Procedure.* Fill the small bulb with sulfur chloride, seal, and put in the 250-cc. side-neck flask. Then put in 25 cc. of 20%  $\text{NaOH}$  soln. (Cl-free). In the 1000-cc. flask put a calcd. excess of 0.2 N  $\text{AgNO}_3$  soln., and in each of the absorption bulbs about 10 cc. of 0.2 N  $\text{AgNO}_3$  soln. After charging the funnel with 25 cc. of fuming  $\text{HNO}_3$  break the sealed bulb with the sliding ramrod. When the sulfur chloride is decomposed, add the  $\text{HNO}_3$  about one drop per sec., and when about half added start to heat gently the flask. Gradually bring to a boil and continue boiling until the atmosphere over the liquid becomes clear. Blow air through the liquid by means of the safety tube to carry over all HCl. The contents of those absorption bulbs containing a ppt. must be added to the large vol. of  $\text{AgNO}_3$  soln. before titrating. The liquid containing  $\text{AgCl}$  is made up to 1000 cc. and 100 cc. is removed from the supernatant liquid to be titrated by the Charpentier-Volhard method, using  $\text{NH}_4\text{SCN}$ . The amt. of Cl in the sulfur chloride can then be calcd. Elaborate directions for assembling the app. and for charging the small sealed bulb are given. C. C. DAVIS

**Determination of nitrogen oxides in processes for nitrogen fixation.** GUY B. TAYLOR. *Chem. Met. Eng.* 23, 1112(1920).—This method is for inexperienced analysts and requires only one standard soln. It is based upon the quant. conversion of  $\text{NO}_2$  to  $\text{HNO}_3$  by  $\text{H}_2\text{O}_2$ . Fill a 2-l. evacuated bottle with gas. Its vol. and vacuum must be known. If excess O is not present in the gas, add enough to the sample to convert all NO to  $\text{NO}_2$ . Det. the temp. and pressure when filled, introduce 25 to 50 cc. of 1.5% neutral  $\text{H}_2\text{O}_2$  soln. and shake until the reddish color disappears. Let stand 5 min.,

shake, and titrate with 0.1 *N* NaOH, using methyl orange. The percentage NO is then  $224a/v[(b-p)/760][273/(273+t)]$  where *a* = cc. of 0.1 *N* NaOH, *v* = vol. of the bottle in cc., *b* = mm. pressure, *p* = mm. pressure in bottle after evacuating but before introduction of sample, and *t* = temp. of sample. This formula disregards vol. change due to formation of NO<sub>2</sub>. If the gas temp. is high, introduce H<sub>2</sub>O<sub>2</sub> with a pipet so that no air can enter. After absorption, introduce a known vol. of H<sub>2</sub>O until the pressure is atmospheric. Then the % of NO is  $224a/[(v-v') - ((b-p-w)/760)(273/273+t)] + 224a$  where *w* = vapor pressure of H<sub>2</sub>O at *t*°, and *v'* = vol. of H<sub>2</sub>O<sub>2</sub> + H<sub>2</sub>O introduced. C. C. DAVIS

**Determination of atmospheric impurities. I, II. OSBORN MONNETT.** *Chem. Met. Eng.* **23**, 1117-21, 1173-6(1920).—A description of the nature of atm. impurities is given with special reference to Salt Lake City, Utah. Ringelmann charts do not indicate atm. impurities near a smoke nuisance or over a city. Impurities are divided into 3 classes: (1) soot from coal (free C, tar, S acids and ashes); (2) gases from coal (SO<sub>2</sub>, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>S, NH<sub>3</sub>, Cl<sub>2</sub>, N acids and CO<sub>2</sub>); (3) non-fuel dust (industrial, street, spores, org. matter, etc.). It is best to use 3 methods to classify both the nature and amt. of impurities: (1) filtration, in which a known vol. of air is filtered, and the wt., color, and microscopic character of the solids are detd.; (2) counting, in which a known vol. of air is blown against glass, and a microscopic count of the no. of particles and their character is made; and (3) settling, where large known vols. of air are confined for many days, with subsequent analysis of solids settled out. Each method is insufficient if used alone. The filtration method is one previously described (Report of Chicago Assoc. of Commerce Committee of Investigation of Smoke Abatement, Rand, McNally and Co., 40-48(1915)). App. is pictured and prepn. of standard solns., absorption solns., and indicators is described in such details that directions for procedure are complete without reference to the source mentioned. Results recorded are of local interest, but show the working accuracy of the author's methods. The concn. of solids in the atmosphere varied from less than 0.1 mg. to 2.5 mg. per cu. m. The total soot fall averaged 250 tons per sq. mi. per yr., 40% of which was combustible. SO<sub>2</sub> concn. was 0.01 to 0.15 parts per 1,000,000. The great influence of topography was proved by the fact that the smoke concn. and soot fall was as high as those in cities consuming 5 to 10 times as much coal. C. C. DAVIS

**Modified method for the determination of water-soluble potash in wood ashes and treater dust. H. D. HASKINS.** *J. Assoc. Off. Agr. Chem.* **4**, 82-4(1920).—Water-sol. potash was detd. in a number of samples of wood ashes and treater dust by the official method. Water-sol. potash was also detd. by allowing the ashes to remain for 2 days in contact with H<sub>2</sub>O before leaching out with hot H<sub>2</sub>O. Ashes thus treated yielded appreciably more water-sol. potash. In the case of ash products containing 12-30% H<sub>2</sub>O, very little advantage results from the preliminary treatment with H<sub>2</sub>O. S. G. SIMPSON

**Use of permanganate in the Kjeldahl method modified for nitrates. I. K. PHELPS.** *J. Assoc. Off. Agr. Chem.* **4**, 69-71(1920).—Results of analyses from a large number of collaborators indicate that the use of KMnO<sub>4</sub> in the Kjeldahl method modified for nitrates may cause loss of N and should be omitted. S. G. SIMPSON

**Investigation of the Kjeldahl method for determining nitrogen. I. K. PHELPS.** *J. Assoc. Off. Agr. Chem.* **4**, 72-6(1920); cf. *C. A.* **14**, 3039.—In the Kjeldahl method for N, when hydrolysis is made in open flasks, the proportions of H<sub>2</sub>SO<sub>4</sub> and K<sub>2</sub>SO<sub>4</sub> and Na<sub>2</sub>SO<sub>4</sub> must be carefully regulated in order not to cause volatilization of NH<sub>3</sub> from the (NH<sub>4</sub>)HSO<sub>4</sub>. No losses in NH<sub>3</sub> were observed when the mixture containing 25 cc. of H<sub>2</sub>SO<sub>4</sub> and 10 g. of K<sub>2</sub>SO<sub>4</sub> or 8.2 g. of Na<sub>2</sub>SO<sub>4</sub> was heated for 2½ hrs. The use of Pb reflux condensers show the effect of H<sub>2</sub>O on the hydrolysis of refractory compds. By using 92.5% H<sub>2</sub>SO<sub>4</sub> it is impossible to hydrolyze 0.4 g. of pyridine zinc chloride completely in 2½ hrs.

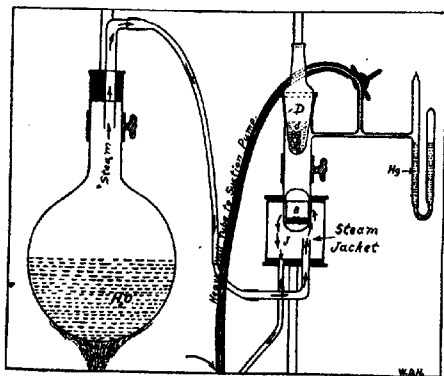
even with the mixtures of  $\text{H}_2\text{SO}_4$ ,  $\text{HgO}_2$  and  $\text{K}_2\text{SO}_4$  found efficient in previous work. With 100%  $\text{H}_2\text{SO}_4$  the hydrolysis is complete in all cases where suitable proportions of  $\text{HgO}$ ,  $\text{K}_2\text{SO}_4$  and acid are maintained. In the presence of 0.7 g. of  $\text{HgO}$ , 10 g. of  $\text{K}_2\text{SO}_4$ , and 10–20 cc. of  $\text{H}_2\text{SO}_4$ , hydrolysis of 0.4 g. of pyridine zinc chloride was complete in  $2\frac{1}{2}$  hrs. These proportions contain slightly more acid than those giving loss of  $\text{NH}_3$  by volatilization. This difference is so slight, however, that hydrolysis in open flasks of refractory compds. must be conducted under closely controlled conditions. This is particularly true in the case of  $\text{Na}_2\text{SO}_4$  because amts. of  $\text{Na}_2\text{SO}_4$  in excess of those proportionate to the suitable amts. of  $\text{K}_2\text{SO}_4$  are necessary. The differences in behavior of the 2 sulfates is probably due to the differences in the tendencies of the acid sulfates to retain  $\text{H}_2\text{O}$ . Consequently, the hydrolysis of very refractory compds. with  $\text{Na}_2\text{SO}_4$  is not recommended, although under very closely controlled conditions excellent results can be obtained.

S. G. SIMPSON

**Note on crucibles used in rock analysis.** HENRY S. WASHINGTON. *J. Wash. Acad. Sci.* 11, 9–13(1921).—For  $\text{Na}_2\text{CO}_3$  fusions a crucible made of Pt-Ir has proved more satisfactory than one of pure Pt because it is less liable to indentation and susceptible of a higher polish, so that fused cakes are easier to remove. For several mos. a Pd-Au crucible has been used for these fusions and has proved even more satisfactory. The av. loss in wt. after each  $\text{Na}_2\text{CO}_3$  fusion is about 0.2 mg., or only about half as much as with a Pt-Ir crucible.

W. T. H.

**A new method for moisture determination.** G. F. LIPSCOMB AND W. D. HUTCHINS. *J. Assoc. Off. Agr. Chem.* 4, 55–7(1920).—See fig. Weigh 1 g. of material into the bucket B. Pass steam through jacket J for several min. and lower the bucket into place.



Adjust receptacle D containing a freezing mixt. of solid  $\text{CO}_2$  and  $\text{Et}_2\text{O}$ , tightening joint with vaseline. After a vacuum has been created allow the sample to remain 5 min., driving the  $\text{H}_2\text{O}$  off by heating with live steam into the vacuum cooled to  $-100^\circ$ , cool in a desiccator and weigh. Repeat the process until const. wt. is obtained. Results on cottonseed meal,  $\text{NaNO}_3$ , acid phosphate, fish blubber and scrap, starch, leather and soils agree favorably

with the respective official methods. Advantages of this method are rapidity and lack of decompn. of org. material.

H. A. LEPPER

**Determination of glucose and starch by the alkaline potassium permanganate method.** F. A. QUITUMBING. *Philippine J. Sci.* 16, 581–99(1920).—Under carefully controlled conditions which have been experimentally worked out, glucose and starch may be detd. by oxidation in alk. soln. with  $\text{KMnO}_4$ . The method is proposed as a possible substitute for the regulation Munsen and Walker method, although it offers no advantages other than a saving of time and material. To det. glucose, place in a 400 cc. Erlenmeyer flask 50 cc. of 0.1 N  $\text{KMnO}_4$ , 25 cc.  $\text{Na}_2\text{CO}_3$  soln. containing 8.48 g.  $\text{Na}_2\text{CO}_3$  per l., and 25 cc. of the glucose soln. to be analyzed, the total vol. being exactly 100 cc. Heat in such a way that the temp. is raised from  $29^\circ$  to  $95^\circ$  in 2 min., and continue heating at  $95^\circ$  for exactly 2 min. Remove the flask and add

gradually 25 cc. of 28%  $H_2SO_4$  and 25 cc. 0.1  $N$   $(CO_2H)_2$ . Titrate the excess  $(CO_2H)_2$  against standard  $KMnO_4$ , adding the latter until the liquid assumes a pink color which is retained for a few seconds. The wt. in mg. of glucose is found from the net cc. of 0.1  $N$   $KMnO_4$  actually used in oxidation by means of the table given below. To det. starch, stir a 2-3 g. sample of the dry material with 50 cc. cold  $H_2O$  for 1 hr. Filter and wash with 250 cc. cold  $H_2O$ . Heat the insol. residue for 3-4 hrs. with 200 cc.  $H_2O$  and 15 cc. conc.  $H_2SO_4$  in a flask provided with a return condenser. Cool and neutralize exactly with  $NaOH$  soln. Bring the vol. to 500 cc., filter, and detn. the dextrose in a 25 cc. aliquot portion as described above. The wt. of starch in mg. is read off from the table below. In the case of flour, the acid hydrolysis gives results about 10% too high, and therefore flour should be hydrolyzed at  $40^\circ$  with 25 cc. of saliva until no test for starch is obtained with I.

TABLE.

Cc. 0.1 $N$ $KMnO_4$	Mg. Glucose	Mg. Starch	Cc. 0.1 $N$ $KMnO_4$	Mg. Glucose	Mg. Starch
5.40	4	3.72	27.88	23	21.39
6.54	5	4.65	28.48	24	22.32
7.68	6	5.58	29.47	25	23.25
8.76	7	6.51	30.46	26	24.18
9.84	8	7.44	31.67	27	25.11
11.08	9	8.39	32.88	28	26.09
12.32	10	9.30	33.81	29	26.97
13.45	11	10.23	34.75	30	27.90
14.58	12	11.16	35.80	31	28.83
15.75	13	12.09	36.86	32	29.76
16.93	14	13.02	37.58	33	30.69
17.85	15	13.92	38.24	34	31.62
18.77	16	14.88	39.38	35	32.55
20.13	17	15.81	40.52	36	33.48
21.49	18	16.74	41.05	37	34.41
22.74	19	17.67	41.58	38	35.34
23.99	20	18.60	42.22	39	36.17
25.13	21	19.53	42.86	40	37.20
26.28	22	20.46	43.35	41	38.13

S. G. SIMPSON

A new absorbent for heavy hydrocarbons. ALEX PIECHOTA. *Chem.-Zig.* 44, 797(1920).—A cold, satd. soln. of  $K_2Cr_2O_7$  in concd.  $H_2SO_4$  has been found to be an efficient absorbent for heavy hydrocarbons and can be used in place of  $H_2S_2O_7$  or satd.  $Br_2$  water. It has the advantage of not attacking  $Hg$  which can, therefore, be used for confining the gas.

W. T. H.

Estimation of phosphatides (BRAUNS, MACLAUGHLIN) IIB.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

A microscopic study of vein quartz. SIDNEY F. ADAMS. Stanford Univ. *Econ. Geol.* 15, 623-64(1920).—The study is confined to veins of hydrothermal origin and to chalcedony and quartz, the most common varieties of silica in veins. (I) A. describes the varieties found in the different types of veins, gel structures, and structures developed in quartz crystd. in free space. The common chalcedony type is *cryptocryst.*, in spherical, botryoidal, and similar structures. These are usually in-

herited from a gel state. Fibrous chalcedony is also described. Chalcedony is usually found only in deposits formed near the surface, and is almost invariably subordinate to quartz. Normal quartz is found in all ranges of deposition. Anomalous varieties, feathered and flamboyant, are found only in low-pressure deposits and may be accessory or prominent. Deep-seated veins characteristically consist of interlocking aggregates of normal quartz crystals in uniform structure. Superficial veins show diversity of structure—crystification in banded, comb, cockade, and spheroidal structure, and colloform structures in microcryst. quartz and chalcedony. Uniformity and lack of it characterize deep-seated and shallow veins respectively. (II) Replacement quartz, replacement structures in fissure veins, and effects of pressure on quartz. Replacement quartz is usually anhedral except when the structure is inherited from the previous mineral, such as easily sol. minerals as calcite. This leads to lamellar or radial structures of the quartz. Pressure results in uneven extinction, various inclusion patterns, shredded quartz due to extreme shearing, and recrystn. of quartz by molecular rearrangement in a crystal to relieve its strained condition. The latter is absent in deposits formed near the surface and its presence may be taken as indicating formation at depth. Many excellent photographs are included.

A. B. PECK

**Augite from Vesuvius and Etna.** HENRY S. WASHINGTON AND H. E. MERWIN. *Am. J. Sci.* 50, 20-30(1921).—Crystals obtained from the bottom of the crater of Vesuvius were 3-5 mm. or more in length, yellowish gray in color and of the usual simple forms. The index  $\beta$  varied from 1.700 to 1.711, extinction angle about  $45^\circ$ . Sp. gr. 3.242. Chem. compn.:  $\text{SiO}_2$  47.60,  $\text{Al}_2\text{O}_3$  6.01,  $\text{Fe}_2\text{O}_3$  3.17,  $\text{FeO}$  4.59,  $\text{MgO}$  14.43,  $\text{CaO}$  21.52,  $\text{Na}_2\text{O}$  0.70,  $\text{K}_2\text{O}$  0.76,  $\text{H}_2\text{O}$  +0.08,  $\text{TiO}_2$  1.52,  $\text{MnO}$  0.13, sum 100.51%. Augite crystals from Mt. Rossi, Etna, from the eruption of 1669 were black,  $\beta$  1.710-1.715, the highest value of  $\gamma$  was 1.735 and the lowest of  $\alpha$  1.702. Sp. gr. 3.378. Chem. compn.:  $\text{SiO}_2$  47.89,  $\text{Al}_2\text{O}_3$  3.55,  $\text{Fe}_2\text{O}_3$  4.17,  $\text{FeO}$  5.98,  $\text{MgO}$  13.40,  $\text{CaO}$  21.49,  $\text{Na}_2\text{O}$  0.70,  $\text{K}_2\text{O}$  0.01,  $\text{H}_2\text{O}$  +0.21,  $\text{MnO}$  0.20,  $\text{TiO}_2$  2.02, sum 99.62%. Thus, the Etna augite is composed largely of diopside and hedenbergite mols. with a little wolastonite and aegirine, and a small amt. of the aluminous Tschermak mol. It much resembles the augite of Stromboli (cf. C. A. 12, 1535).

L. W. RIGGS

**Descloizite from the Perigua mine, Sobral da Adica.** ALFREDO BENSUADE. *Bull. Soc. Portugaise Sci. Nat.* 8, 154-6(1920).—This mineral occurs as small brown crystals forming a layer approx. 0.5 mm. thick on a strongly ferruginous, soft, compact limestone. Seen by transmitted light the color is deep red. The luster is vitreous on the rounded faces, oily on fractured surfaces.  $H = 3.5$ ; sp. gr. = 6.0. Analysis gave:  $\text{H}_2\text{O}$  2.3,  $\text{V}_2\text{O}_5$  22.32,  $\text{PbO}$  61.77,  $\text{ZnO}$  2.10,  $\text{CuO}$  0.28,  $\text{MnO}$  0.74,  $\text{FeO}$  0.22 and  $\text{As}_2\text{O}_3$  0.11%. The Mn should be considered as an impurity, as the crystals rested upon an extremely friable thin layer of wad.

ALBERT R. MERZ

**Economic geology and stratigraphy of the Gunflint iron district, Minnesota.** T. M. BRODERICK. *Econ. Geol.* 15, 422-52(1920).—The general geology of the area is described, that of the Gunflint iron-bearing formation in detail. No hematite ore is known at present and although exploration is not complete, the chances of finding any amount of hematite ore do not appear to be bright. A 5-foot bed of carbonate ore is known but is too high in calcite to be of present value. Magnetite ore for concn. offers the only possibilities so far as now known. The formation runs about 25% Fe and on concn. yields from 47 to 64% Fe. Comparison with the east Mesabi district shows that tonnage and costs of mining and concn. favor the Mesabi and until these operations have proved profitable there, operation in the Gunflint area based on present known facts would be premature.

A. B. PECK

**Chalcopyrite deposits in Northern Manitoba.** E. L. BRUCE. *Econ. Geol.* 15, 388-97(1920).—The topography and geology of the region are described and discussed. Two ore deposits, the Flinflon and the Mandy ore body, are described. The rocks

associated with the deposits are much altered volcanics overlain by remnants of sediments and intruded by granites of 2 ages. The ore comes from a segregation of chalcopyrite in a lens consisting of chalcopyrite, sphalerite, and pyrite. Pyrite formed first in shear zones in greenstone or as a replacement of drag folds in schistose bands. Later fracturing was followed by chalcopyrite and sphalerite. The ore solns. are thought to have been hydrothermal and to have been derived from the late granite intrusions. Analyses of a granite and a gneiss are given.

A. B. PECK

**Ore deposition in the Bolivian tin-silver deposits.** W. MYRON DAVY. *Econ. Geol.* 15, 463-96(1920).—A short history of the various theories of the origin of the deposits is given. They are located along the Cordillera Real at elevations of 12-20,000 feet. The granite core of the range is flanked by shales, sandstones, conglomerates and quartzites, into which many apophyses and dikes of porphyry intrude. The latest evidence points to intrusion in late Tertiary time. The veins vary from fissures 1 meter wide up to mineralized brecciated zones several meters wide. The types of mineralization are discussed in detail. Hypogene mineralization took place in and about coarsely crystd. granite. This grades into veins in and surrounding quartz porphyry intrusives. Supergene enrichment was important, especially in Ag-bearing veins. Enrichment of Sn also took place by removal of the more sol. material, leaving oxidized ores rich in Sn. Much "wood tin" also appears to be supergene. The ores are classified as the high-temp. vein zone and the intermediate zone. Subdivisions are based on the mineral compn. Each is described in detail, the basis of examn. being both thin and polished sections. In the latter, one new unknown mineral is described. It has the gray color of sphalerite but is slightly harder, effervesces and darkens with HNO<sub>3</sub>. It occurs in fine veinlets cutting cylindrite, and can not be isolated for analysis, but as far as detd. contains no constituents foreign to cylindrite. It does not resemble known Pb and Sb minerals and is believed to be a *natural tin sulfide* or other unknown Sn mineral. Of supergene products a substance locally known as "kermesita" is described. It does not prove to be kermesite, but is rather believed to be a meta-stibnite. Another occurrence described is a mixture of realgar and native As, the whole appearing similar to dark limonite. In general paragenesis of the vein minerals shows tourmaline, topaz, pyrite, arsenopyrite, and quartz first developed, Sn and Bi minerals follow, after which are Zn and Cu minerals and lastly jamesonite and ruby-silvers. The sequence is not sharp but usually overlaps somewhat. It is believed that no decline will come for many years, new deposits will be found along the eastern contact of the granite core, and that modern methods of mining and milling will greatly increase the output.

A. B. PECK

**Cassiterite veins of pneumato-hydatogenetic or hydrothermal origin. A study of the copper-tin veins of the Akenobe district in the province of Tajima, Japan.** TAKAO KAKO. *J. Coll. Sci. Imp. Univ. Tokyo* 43, Art. 5, 59 pp.(1920).—This district contains the Akenobe mine, the most important Sn mine in Japan, with a production for 1918 of over 300,000 lbs. of metallic Sn. The ores were originally mined for Ag-Cu, but now as much Sn ore as Cu ore is produced. The district consists of sedimentary rocks of Paleozoic and Mesozoic ages together with igneous rocks, including diorites, porphyrites, andesites and liparitic rocks. A new rock name proposed is *akenobite*, a leucocratic differentiate from a diorite magma of the compn. of a quartz-monzonite-pegmatite or aplite but possessing a peculiar structure. The most important of the rocks enclosing the veins is a black carbonaceous slate which is much altered in their vicinity. The region is considerably faulted. The veins are thought to be all of the same age and the mineralization has apparently come from the later offshoots of a diorite magma. The relative amount of Sn in the veins decreases with distance from the diorite. The ore occurs in shattered zones along fissures which have been repeatedly reopened and recemented. There are 5 successive stages in the mineralization, namely,

deposition of (1) the main cassiterite ore, (2) wolframite-cassiterite ore, (3) chalcopryrite, (4) zinc blende, and (5) barren quartz with a little chalcopryrite. The main cassiterite ore contains chalcedony with small amts. of siderite, fluorite, scheelite, pyrite and chalcopryrite. From the presence of chalcedony it is argued that the deposits were formed under hydrothermal rather than pneumatolytic conditions. Details of geology, petrography and ore structure are discussed thoroughly. Illustrated.

E. V. SHANNON

**The R. and S. molybdenum mine, Toas County, New Mexico.** ESPER S. LARSEN AND CLARENCE S. ROSS. *Econ. Geol.* 15, 567-73(1920).—The ore occurs in a Na-K alaskite porphyry. The veins are a result of mineralization of fracture and shear zones and the yellow molybdc ocher makes outcrops conspicuous and easily traced. The mineralized zone is rather const. in width from 4-6 feet. The vein developed for 300 feet has been uniform in ore, but it appears probable that the ore bodies are lenses which pinch out and may be followed by others farther along. The ore is quartz with a large proportion of molybdenite, some pyrite, and a little chalcopryrite, fluorite, sericite, apatite, biotite, chlorite, and calcite. The alaskite was sheeted before ore deposition began and minor movements continued up to the time the last mineral, calcite, formed. Erosion has been so rapid that the oxidized mantle is very thin and consists of molybdc ocher ( $\text{Fe}_2\text{O}_3 \cdot 3\text{MoO}_3 \cdot 7\frac{1}{2} \text{H}_2\text{O}$ ) and limonite in small amts. Occurrences and associations indicate that the ore has been deposited by ascending magmatic waters of moderate temps. The ore exposed is of good grade and uniform. Very little work has yet been done but indications are good.

A. B. PECK

**Tungsten deposits of Burma and their origin.** J. MORROW CAMPBELL. *Econ. Geol.* 15, 511-34(1920).—The ore occurs in veins in a highly acidic granite near its periphery or in overlying sediments from the contact to over 600 or 1000 feet vertically above it. Ores occur in the granite as primary minerals, in greisen, and in veins of quartz, quartz with mica, and pegmatite. Ore-bearing veins are rarely over 5 feet in width, generally less, but are frequently numerous. Most of the mines are small patches generally not over 2000 feet in greatest dimension. Most of the ore comes from quartz veins or detrital matter on the hillsides below vein outcrops. Very few true alluvial deposits are W-bearing. Greisen and pegmatite are sometimes rich but the total output is small. W ores as primary minerals in the granite are rarely of importance economically. The av. W content in the quartz W ores is 1%, sometimes 2%. Mining and recovery are crude, Chinese labor being used. Great variability of richness is characteristic of all the veins. The main W minerals are wolframite and scheelite. Cassiterite is also often present. Accessory minerals are pyrite, molybdenite and Bi. Other sulfides of Fe, Cu, Zn, Sb, Pb, may also be present. Very few pneumatolytic minerals and no tourmaline are found. Molybdenite is first to form, wolframite follows, and then pyrite, cassiterite, scheelite, and quartz. The decompn. of wolframite and scheelite by ground waters of the district is described. A discussion of the deposition of the ores in the veins and segregation of ores in magmas through the agency of Si in combination with O and hydroxyl closes the paper.

A. B. PECK

**Some Canadian occurrences of pyritic deposits in metamorphic rocks.** GEORGE HANSON. *Econ. Geol.* 15, 574-609(1920).—Sulfide ore bodies from northern Manitoba, Ontario, and Quebec, are discussed. The geology, history of discovery and production, the character and occurrence of the ore bodies, mineralogy, and genesis of the deposits, are described and discussed for each body. General conclusions reached are that the form of individual lenses is governed by the nature of the enclosing rock, that although many deposits show a rather distinct vein-like structure schistose rocks tend to develop distinctly lenticular bodies. It is believed that the ore bodies have been formed after the rocks were rendered schistose and that the size of the body is often governed by the degree of schistosity, ore being most abundant in the zones of greatest shearing.

The ore bodies generally lie parallel to the planes of schistosity. As to the whole ore zone, many deposits consist of only one lens, others of many lenses usually arranged *en echelon*. The latter form is often found at the contact between rocks of different competency, others in apparently homogeneous schists. In such cases it is thought that the arrangement is detd. by the zones of less competent material in the original rock. Banded structure may be the result of post-ore metamorphism or the ordinary replacement of the schistose rock. While some Norwegian and the Sudbury pyrrhotite deposits seem to be magmatic injections, it is believed that pyritic magmatic injection deposits are rare but are formed through the agency of solns. It is believed that the source of the pyritic material is in the varying character of the magmatic solns. given off by a magma at different stages of differentiation and that the order of crystn. as well as the type of mineralization in the deposits throws light on the source of the material. Since pyrite is the first sulfide to crystallize in pyritic as well as other sulfide deposits formed by hydrothermal solns. and since pyrite is the main constituent of pyritic deposits, it is believed that they represent an earlier stage in the differentiation than chalcopyrite, sphalerite and tetrahedrite deposits. A. B. P.

**The physical and chemical character of New Jersey greensand.** GEORGE R. MANSFIELD. *Econ. Geol.* 15, 547-66(1920).—Supplementary to C. A. 14, 512. Sepn. by washing shows an av. of 19.5% of fines in samples from various localities. Magnetic sepn. of the above residues shows an av. of 89.9% glauconite, and beds of unaltered greensand show 73% glauconite grains. Considerable glauconite is also in the fines. Glauconite grains are most commonly  $1/32$ – $1/40$  inch in size. Their shape is irregular, suggesting mechanical concn. The smaller grains are more rounded suggesting transportation. Chem. analysis shows about 50%  $\text{SiO}_2$  and relatively high  $\text{Fe}_2\text{O}_3$ ;  $\text{K}_2\text{O}$  is variable. Small amts. of  $\text{CaCO}_3$  and Ca phosphate are usually present. Coarse and fine materials show almost the same  $\text{K}_2\text{O}$  content. Comparison shows more FeO and  $\text{K}_2\text{O}$  in older beds, although  $\text{Fe}_2\text{O}_3$  is still present. The better N. J. greensand belts are almost pure glauconite. The highest water-sol.  $\text{K}_2\text{O}$  in any sample was 0.06%. Thin sections show glauconite grains to be aggregates of fine cryst. flakes without a core or skeleton.  $\text{K}_2\text{O}$  in circulating waters of the beds is probably being withdrawn from soln., producing enrichment, especially along clayey layers. Glauconite is not all formed through the agency of organic matter. Photographs of the appearance of the glauconite grains accompany the paper. A. B. PECK

**Kaolin of Indiana.** W. N. LOGAN. Ind. State Dept. of Conservation, *Bull.* 6 (1920); *Econ. Geol.* 15, 542(1920).—The beds occur at or near the top of the Mississippian in several counties in the S. W. part of the state. All beds have sandstone above and shale below. Only slight com. development has taken place to date, although large quantities of high-grade white clays are present. The discussion covers the physical and chem. properties of the kaolin, geological conditions of occurrence, origin, uses, and distribution by counties. Earlier explanations of origin are disproved. Lab. expts. and microscopical examn. show that the origin is biochemical. Certain S bacteria are believed to be able to secrete kaolin. The S bacteria obtain S from pyrite in the shale.  $\text{H}_2\text{SO}_4$  formed attacks the shale and the resulting compd. reacts with quartz of the sandstone, S being replaced by  $\text{SiO}_2$ , forming kaolin. A. B. PECK

**High-grade talc for gas burners.** J. S. DILLER, J. G. FAIRCHILD and E. S. LARSEN. *Econ. Geol.* 15, 665-73(1920).—The production and imports of talc for the purpose mentioned are briefly discussed. The talc thus used is usually found in metamorphic limestone and in some instances in altered basic igneous rocks. Domestic deposits at Hewitts, N. C., and in Harford County, Md., and foreign deposits in Germany, France, Italy and India are described. Chem. analyses are given for material from each locality. Microscopic examn. shows chlorite to be the most abundant associate, usually from 3 to 15%. Compn. is the most important factor in detg. its suitability



for gas tips. Fineness and uniformity of texture follow in importance. In these the German talc excels others; it is the product of chem. action during contact metamorphism, and no similar deposits are known in the U. S. A. B. PECK

**The Palangana salt dome, Duval County, Texas.** DONALD C. BARTON. *Econ. Geol.* 15, 496-510(1920).—The physiography, surface and subsurface geology are discussed. The outline and limits of the salt core as determined by drill records are given. A "breathing" well is described and possible causes of its action discussed. Although no important shows of oil or gas have yet been encountered, it is believed there is still a chance for finding some with more extensive drilling. The dome is held to be due to intrusion of the salt core. A. B. PECK

**Coal in eastern Idaho.** GEORGE R. MANSFIELD. U. S. Geol. Survey, *Bull.* 716F, 123-53(1920).—The results of the examn. of this locality were disappointing. Several mines and prospects are described, but the amt. of coal was small and the position of the beds such that mining operations would be expensive. The quality of the coal was inferior to that of the Wyoming deposits. Phosphatic shale yielding oil on destructive distn. was found. L. W. RIGGS

**Experimental studies of subsurface relationships in oil and gas fields.** R. VAN A. MILLS. *Econ. Geol.* 15, 398-421(1920).—The purpose of the paper is to study accumulation of oil and gas as affected by varying conditions of stratification of the sands, differences in size of grain of the sands, and the directions and rate of flow of water. A chloride brine soln. of sp. gr. 1.100 was used. Factors resulting in injury to gas and oil wells, such as infiltrating water, also were studied. The apparatus and methods of its use are described in detail. The described results are illustrated by photographs. A. B. PECK

**The geology of the Portland Canal district.** VICTOR H. WILHELM. *Min. Sci. Press* 122, 95-6(1921).—During the Coast Range granitic uplift of the Jurassic period the area was intruded by a series of granitic and porphyritic rocks, and during the period of readjustment sheared and mineralized by ascending solutions from the dying batholith. Subsequent to this the entire district was intruded by dioritic dikes, which cut the sheared area. Complex metallic sulfides are disseminated through the quartzporphyry. A. H. HELLER

**Volcano Oshima Idzu.** SEITARO TSUBOI. *J. Coll. Sci. Imp. Univ. Tokyo* 43, Art. 6, 146 pp.(1920).—The structure, morphology, volcanic history and petrography of the island are treated in detail. Special methods devised for the optical study of the constituent minerals of the igneous rocks are described. Rocks described in detail include basaltic bandaite almost free from phenocrysts of mafic minerals; hypersthene-basaltic bandaite; two-pyroxene basaltic bandaite; hypersthene-bearing augite-olivine-bytownite basalt; miharaite; two-pyroxene olivine-anorthite basalt; olivineless-bytownite basalt (alpha and beta); micro-allivalite, augite-micro-diorite, ashes, sands, lapilli and bombs. The new name proposed, *miharaite*, is for a quartzofeldic aphanite in which the normative Ca-Na feldspar is bytownite. The petrographic descriptions are unusually complete, the *ns* and other optical properties having been carefully and fully worked out for many of the constituent minerals. These descriptions are accompanied by many quant. analyses and with appropriate calcns. and discussion showing the positions of the various rocks in the quant. and Osann classifications. E. V. SHANNON

**Relations of subjacent igneous invasion to regional metamorphism.** JOSEPH BARRELL. *Am. J. Sci.* [5] 1, 1-19(1921).—The subject is discussed under (1) regional relations; (2) metamorphic and metasomatic relations of orogenic batholiths, and (3) interpretation of dynamo-metamorphic features in the roofs of batholiths in mountain provinces. Summaries, by Frank F. Crout: (1) Batholithic invasions widen downward and may occur close below many rocks where they have not been suspected;

those in the American Cordillera seem to come to place without crustal compression, but those of the Archean shield and those of the later Appalachian invasions are accompanied by compression. A detailed study of 3 or 4 regions shows the metamorphism to be related to the igneous invasion more than to the depth and pressure. One of the regions of deepest burial and close folding in Pa. shows slight metamorphism. (2) The action of magmas, both by heating and metasomatism, is reviewed. The solns. are not meteoric in origin. The results in minerals depend on equilibria—largely on the presence of  $H_2O$  and  $CO_2$ . The depth of anamorphism may be small, due to weakness of some rocks or to invasion of batholiths. An argument for shallow depth is based on the completeness of Archean metamorphism and the salt of the ocean as a measure of erosion. (3) The features of metamorphic rocks are reviewed and interpreted as due to one or another factor. Major factors are batholithic invasion and compression. Movements of solns., selective crystns., *lit-par-lit* injection of gneisses, and the alteration of injection and mashing, each leave their marks. L. W. RIGGS

An easy method for identifying tinstone (ZÖLLER) 7. Strength of carbonic acid at higher pressures (HAEHNEL) 2. The zinc oxide plant of the Utah Zinc Co. (PARSONS) 26. The Labarge, Big Piney and Dry Piney oil fields (CRITTENDEN) 22. Age of the autinites of Portugal (MUGURT, SEROIN) 3.

## 9—METALLURGY AND METALLOGRAPHY

WILLIAM BRADY, ROBERT S. WILLIAMS

**Surface energies in flotation.** FREDERICK G. MOSES. *Eng. Mining J.* 111, 7-11(1921).—Flotation is explained on the basis of the distribution of small solid particles between two immiscible liquids according to the theory of Reinders. It is pointed out that the conditions for flotation may be met with gang minerals as well as with sulfides. Practical flotation depends on controlling conditions so that the interfacial tension of the oil-water interface is greater than the sum of the interfacial tensions between the solid and the two liquids for the sulfide mineral but not for the gang. In an experiment to separate sulfides from fluorite by flotation the fluorite floated instead of the sulfides. R. S. DEAN

**The present status of flotation.** T. A. RICKARD. *Mining Sci. Press* 122, 119-24 (1921).—A comprehensive review of the earlier suits of Minerals Separation with the Butte and Superior Min. Co., and the Miami Copper Co., together with the latest suits against the Nevada Cons. Copper Co., and the Magma Copper Co. A. H. H.

**Notable results with mechanical charging.** ANON. *Iron Age* 106, 1541-2(1920).—The Lavino Furnace Co., at Sheridan, Pa., increased the production of its ferro-Mn blast furnace from 71 to 89 tons per day by replacing hand filling by mechanical charging. Aside from the increased tonnage, the saving effected amounted to 50% per year of the cost of the whole installation. Charging laborers were reduced from 40 to 12 men. Details of the installation are given. A. BUTTS

**Recovery of silver from manganese-silver ores.** JAY A. CARPENTER. *Eng. Mining J.* 110, 898-902(1920).—Mn-Ag ores cannot be treated economically successfully by cyaniding or flotation methods. Combining cyaniding with a reducing process solved the problem for the Nipissing low-grade Ag ores in which the Ag was combined with As or Sb in refractory sulfides, but does not work with the refractory Mn-Ag oxidized ores. Out of many failures has developed a process consisting of a chloridizing roast, which may use  $NaCl$  or a mixt. of this with  $CaCl_2$ , volatilization of the chlorides, pptn. of these volatilized chlorides with a Cottrell precipitator and subsequent cyaniding. About 900° is recommended for the roasting temp. The presence

of carbonates in the ore appears to be beneficial. For ores carrying 0.5 oz. Au, 40-50% of the Au was volatilized in 45 min. at 900° in the chloridizing roast. Only coarse crushing is necessary. The present high price of silver plays its part in making the process profitable. A bibliography is appended.

E. H. DARBY

**Recovery of gold from black sand.** JOHN GROSS. *Mining Sci. Press* 121, 770 (1920).—The materials treated were coarse and fine tailings from the expts. on the recovery of Au from black sand at the Alaska station of the U. S. Bur. of Mines. The coarse tailing had been produced by amalgamating the classifier concentrate. An enriched product could be produced from this by hand jigging but this product cannot be barrel-amalgamated without further grinding. If produced in sufficient quantity it could be shipped to a smelter but the amt. of black sand produced by each operator is small. The fine tailing had been obtained by concn. of a minus 30-mesh material on a canvas table. This tailing was again passed over a canvas table to produce a small amt. of concentrate. The gold in this concentrate can be recovered by barrel amalgamation.

R. S. DEAN

**Notes on the influence of soluble silica and calcium salts on precipitation.** J. HAYWARD JOHNSON. *J. Chem. Met. Soc. S. Africa* 21, 58-62(1920).—The object of the paper is to provoke discussion regarding conditions interfering with pptn. of Au on Zn in cyaniding. During periods of poor pptn. a deposit was found on Zn sand soln. pptn. boxes which was found to be principally  $\text{CaCO}_3$  and gelatinous  $\text{SiO}_2$  containing  $\text{H}_2\text{O}$ . A scum was also found at the head and between compartments of sand soln. pptn. boxes which was practically the same as the deposit. J. feels that colloidal  $\text{SiO}_2$  has considerable detrimental effect on pptn. and noticed that when trouble occurred  $\text{SiO}_2$  formed on filter papers in a gelatinous film, almost impervious to  $\text{H}_2\text{O}$  and causing rapid rise in pressure on the filter press. J. points out that excessively burnt lime from limestone carrying  $\text{SiO}_2$  will introduce sol.  $\text{SiO}_2$  into soln.; carbonates and sulfates of lime are also claimed to form protective coatings on Zn after water becomes satd. with them. It is brought out in discussion that another source of trouble is caused by formation of colloidal S and  $\text{FeSO}_4$  formed in ore allowed to lie too long in stopes or on surface. Addition of 20 lbs. lime per ton of oxidized ore improves this condition somewhat. A better remedy would be not to allow stope sweepings to accumulate longer than 2 weeks.

H. C. PARISH

**Domestic production of copper during 1920.** H. A. C. JENSEN. *Elec. Rev.* 78, 174(1921).—The smelter production of Cu from domestic (U. S.) ores during 1920 was 1,235 million lbs. as compared with 1,286 million lbs. in 1919. Further details are given.

C. G. F.

**Application of waste-heat boilers to open-hearth furnaces.** THOMAS R. TATE. *Assoc. Iron & Steel Elec. Eng.* 2, No. 12, 1-10(1920).—Present installations, of which nearly all large steel companies have at least one, comprize boilers of the fire tube type and horizontal and vertical water tube boilers. The design of the proper size and type boiler should be detd. upon the basis of wt. of waste-heat gases from any given size furnace and tonnage rate. Wt. can be calcd. from the amt. of C content in fuel and charge per ton of ingot steel produced and from analysis of gases and their at. wts. The temp. of the gases entering the boiler ranges from 900° to 1400° F. An av. temp. of 1200° should be obtained under proper conditions. Induced draft is necessary for success. It can be controlled from the melting platform with a variable speed motor. Superheaters and soot-blowing equipment are necessary and feed water regulators are advisable. A formula is given for calcg. h. p. which can be developed and a proper size boiler for this h. p.

H. C. PARISH

**Remodeled blast furnace.** ANON. *Iron Age* 106, 1064-5(1920).—A description of improvements recently made at the plant of the Belfont Iron Works Co., Ironton, O. The blast furnace, which was blown out on June 11, 1919, was enlarged from 150 to

250 tons daily capacity and put back on blast on Aug. 31, 1920. The bosh was lowered and made steeper, the batter of the inwall was increased, and the hearth and bosh diameters were increased, giving a total furnace capacity of 9280 cu. ft. Two new 2-pass hot-blast stoves, 20 by 80 ft., having a combined heating surface of 120,000 sq. ft., were installed and used in conjunction with a third 20 by 80 ft. stove, giving a total heating surface of 158,000 sq. ft. The new boiler plant consists of 7 water-tube boilers, with a total capacity of 2100 h. p. The boilers are provided with gas burners equipped with butterfly regulating valves and positive shut-off valve. The blowing plant consists of a 22,000 cu. ft. capacity turboblower with auxiliary connection to the old reciprocating blowers for emergency use. The pre-existing labor force of approx. 120 men was decreased to one-half, due to the use of labor-saving devices.

A. L. FEILD

**Green wood in the blast furnace.** FRANÇOIS PRUDHOMME. *Iron Age* 107, 121-2 (1921).—The blast furnaces at Corral, Chile, are described and data are given on cost of production, on products of decompn. of wood and on thermal balance. E. H.

**Variations in the heat supplied to the blast furnace, and their effect on the fuel consumption.** W. W. HOLLINGS. *Iron and Steel Inst.* 1920 (advance copy), 12 pp.; *Engineering* 110, 459-60 (1920).—A relationship exists in the blast furnace between heat added to and heat developed and absorbed within the furnace, whereby the ultimate calorific effect of a variation in the heat supplied is in geometric ratio to the amt. of the initial charge; and consequently, for countries with a low av. abs. moisture as England, it does not pay to install the dry blast. The crushing of the materials of the charge to a uniform size may be expected to result in a considerable economy of the fuel required per ton of pig Fe. The process of blowing with O-enriched air is not likely to result in any appreciable saving for a small % increase in the O.

V. O. HOMERBERG

**Bradford process at Pope-Shenon.** ANON. *Salt Lake Mining Rev.* 22, No. 2, 33.—The process worked out by Dr. Robert H. Bradford of the U. S. Bureau of Mines expt. station at the Univ. of Utah should have appended "volatilization," since it might be confused with the well known Bradford process of selective flotation of sulfide ores. Bradford's process as applied to copper ores consists essentially in grinding the copper ores to 12 mesh, mixing with NaCl and heating in a rotary furnace to dull redness.  $\text{Cu}_2\text{Cl}_2$  fumes are formed, which are caught in a Cottrell precipitator. Lime and coke are added to the fume and fused in a bullion furnace, with the production of metallic Cu and  $\text{CaCl}_2$ . At present a 50-ton unit is operating at this Idaho mine.

A. H. HELLER

**Recent developments at the Yellow Pine Property.** PERCY M. CROPPER. *Salt Lake Mining Rev.* 22, No. 4, 23-5 (1920).—This mine, located at Goodsprings, Nevada, the heaviest shipper of zinc carbonate in the United States, has recently been carrying on some interesting experiments, in cooperation with the United States Bureau of Mines, on the volatilization of its ores by the chloridizing process. At present the grade of the zinc carbonate is simply raised by calcination. With the chloridizing process it will be possible to recover 96% of the silver and 92% of the lead in the form of a concd. fume, leaving the zinc as a concd. residue. A Cottrell precipitator is being built for larger tests. Salt is used as a chloridizing agent. The present milling operations of jigging and tabling are described together with a general history of the property, and its economic problems.

A. H. HELLER

**Notes on nickel.** PAUL D. MERICA. *Chem. Met. Eng.* 24, 17-21 (1921).—Metallurgy is discussed and data are given on the uses and application of the various grades of metallic Ni as well as for the principal salts used in electroplating and -typing.

S. D. K.

**Physical properties of nickel.** PAUL D. MERRICA. *Chem. Met. Eng.* **24**, 73-6 (1921).—The second article reviews physical, mechanical, thermal, electrical and optical properties of pure Ni and cites 35 references to literature on this subject.

S. D. K.

**The application of pyrometers to foundry work.** W. BOWEN. *Chem. Age (London)* **3**, 556-7(1920).—The article contains a brief general discussion of pyrometry as applied to foundry work but describes no new scientific contribution. A. G. W.

**Core-baking ovens electrically heated.** J. L. JONES. *Elec. Rev.* **78**, 132-4(1921); cf. *C. A.* **15**, 46.—A new thermostat consists of a strip of porous refractory material impregnated with a material, nonconducting up to a given temp. but conducting above it. The strip is supported by Ag terminals and connected to a suitable relay, motor-driven switch and small transformer. The impregnating material (not divulged) regulates the temp. required for core-oven work and is capable of controlling temps. from 65° to 800°. The wt. of core plates should be reduced to a minimum consistent with stiffness. Tables show percentages of various ingredients in core materials and the strength of cores made under various conditions in electrically heated ovens.

W. H. BOYNTON

**Air-furnace iron for big castings.** H. E. DILLER. *Foundry* **48**, 973-7(1920).—The chief advantage of the air furnace is that in it large tonnages of hot, homogeneous metal, which can be controlled closely as to compn., can be made. It finds an important place in roll foundries and a few others. D. describes one of the foundries of the Westinghouse Elec. & Mfg. Co., located at Lester, Pa., where there are installed two 40-ton and one 15-ton air furnaces, as well as 4 cupolas. Since all 3 air furnaces, with a rated capacity of 95 tons may be tapped at the same time and since each may be charged in excess of its rated capacity, it is possible to secure 100 tons of hot metal at one time. This foundry is equipped to pour castings requiring 150 tons of metal. The air furnaces are of the broken-back type, which, while less efficient as a melting medium than the straight-back furnace, is more easily charged and has a longer roof life. A new bottom is made after each heat. When the slag has been cleaned out, a layer of burned core sand is spread over the bottom and covered over with 1 in. boards to prevent the charge from digging into the sand. The method of placing the charge is important and is described in detail. If the Si is low in the metal when melted, additions of FeSi are made. If the test shows 1.45% Si and if 1.65% is desired in the finished metal, enough FeSi to bring the Si content to 1.75%, theoretically, is added. About 0.30% Si is lost in the entire melting operation. Almost as much Mn is lost. When the Mn is too low in the bath, FeMn is added. Likewise, C is burned out to a considerable extent; the metal contains from 3.00 to 3.20% C when ready to tap, without any steel additions having been made to lower the C content. The av. 40-ton heat is ready to tap approx. 11 hrs. after the furnace is lighted. The temp. of the metal is about the same as that of metal tapped from the cupola. The air-furnace product is more homogeneous and has a lower S and total C content. Sometimes as much as 80% of the charge is scrap metal. The air-furnace Fe is believed to be cleaner and freer from slag inclusions than is cupola Fe. It shrinks less internally and tends to form a more homogeneous casting, although its contraction is slightly greater. The av. heat contains 1.65 Si, 0.065 S, 0.50 P, 0.50 Mn, and 3.00-3.20% total C. Skeleton patterns are largely used and many of the large cores are made on greensand arbors. *Molding practice* and shop lay-out are described in some detail.

A. L. FIELD

**Pipe cast centrifugally.** A. F. MACALLUM. *Iron Age* **106**, 1470(1920).—A paper read before the Engineering Institute of Canada, Montreal Branch, on the DeLavaud process of making centrifugally cast Fe pipe. The present specifications for cast Fe pipe are based on Fe having a tensile strength of 19,000 lbs. per sq. in. When higher

standards are given under present foundry practice, the pipe is apt to be brittle. A revision of specifications to meet new conditions is being considered. In the process employed by DeLavaud a regulated quantity of molten Fe is introduced into a revolving water-cooled cylindrical mold. The centrifugal force acting spreads the molten metal uniformly upon the inner surface of the mold, where it solidifies. Although brittle at first, due to its outer surface being chilled, it becomes tough and much stronger than ordinary cast Fe pipe on being annealed. The pipe thus made has a decidedly different structure from that of pipe cast in sand molds and does not show the segregation found in the latter. The pipe is a dense, homogeneous, fine-grained Fe throughout, with out blowholes due to  $H_2O$  or gas, and, because of this d. and strength, can be made much thinner. Tests show the following results on centrifugally cast and sand-cast pipe, resp.: tensile strength, 39,000 and 16,000 lbs. per sq. in.; modulus of elasticity, 14,500,000 and 8,860,000; modulus of rupture, 63,800 and 33,900; quality factor, 20.2 and 9.8. These measurements refer to a centrifugally cast pipe of 0.28 in. wall thickness and to a sand-cast pipe of 0.51 in. wall thickness. A 12-ft. length of 6 in. centrifugally cast pipe weighs 280 lbs., as compared with 430 lbs. for a 6 in. sand-cast pipe. The former has a smooth interior and exterior surface and takes a uniform surface coating. Hydraulic frictional losses are reduced on account of the smoothness of surface.

A. L. FEILD

**Problems encountered in gas engine castings.** PAT DWYER. *Foundry* 48, 980-3 (1920).—A description of the practice pursued at the plant of the Rathbun-Jones Engineering Co., Toledo, O., which company specializes in the production of gas and oil engines up to 1000 h. p. Nearly all the castings are poured in dry-sand molds. While the initial cost of a dry-sand mold exceeds that of one made from green sand, an ultimate saving is effected in the percentage of good castings obtained. This is particularly true of castings which must withstand steam, gas, or  $H_2O$  pressure and of castings on which there is considerable machine finishing. To facilitate drying of the molds, the drags of all flasks are provided with bars and bottom plates are dispensed with. The flasks for the bed plates are designed to hold a minimum quantity of sand. Details of *molding practice* are given, illustrated by photographs. All cores are given at least one coating of black wash, of the kind known to the trade as "silver lead." The Fe is melted in a cupola lined with 41 in. The bed charge of coke weighs 1200 lbs., while succeeding charges of Fe and coke weigh 1600 and 300 lbs., resp. Charcoal Fe is employed in the charge for castings subjected to a pressure test in order to promote high d. and also to prevent segregation in castings containing sections of uneven thickness. The steel scrap used in making *semi-steel* consists principally of short pieces of rails and fish plates. For ordinary Fe castings which do not have to stand a pressure test, the metal is poured from a mixt. of approx. 1000 lbs. pig Fe and 600 lbs. of scrap.

A. L. FEILD

**Die castings.** C. PACK. *Mech. Eng.* 42, 434-5(1920).—The die-casting process is best adapted to alloys of comparative low fusing points. P. divides these into 4 groups, the Zn alloys, consisting essentially of Zn alloyed with Sn, Cu or Al; the Sn alloys, consisting essentially of Sn alloyed with Cu, Pb or Sb; the Pb alloys, consisting essentially of Pb alloyed with Sn or Sb; Al alloys, consisting essentially of Al alloyed with Cu. These groups are discussed, and the compn., properties, casting limits, general design and the applications of a typical alloy in each group are included.

V. O. HOMERBERG

**Gray-iron castings.** R. MOLDENKE. *Mech. Eng.* 42, 437-9(1920).—A general discussion is given with special reference to the chem. compn. of gray-Fe castings and the influence of these constituents upon the mechanical properties. A table of recommended analyses for various classes of castings is included.

V. O. HOMERBERG

**Steel castings.** J. H. HALL. *Mech. Eng.* **42**, 432-4(1920).—The range of wt. of steel castings is practically unlimited. H. discusses the physical properties of steel castings, the annealing and heat treatment, the cost and where steel castings should be specified.

V. O. HOMERBERG

**Malleable castings.** E. TOUCHBA. *Mech. Eng.* **42**, 431-2(1920).—The true legitimate field of gray Fe should and will in time be restricted to the production of that size of casting that cannot successfully be produced in malleable Fe and is too costly to produce in steel, while it is peculiarly well fitted for such castings as are designed to sustain static compression, for which purpose the gray-Fe casting is without question superior to either of the other 2. The av. ultimate tensile strength of the gray-Fe casting as measured by the test bar does not exceed 20,000 lbs. per sq. in., while it possesses practically no ductility. The av. ultimate strength and elongation of the product from over 60 malleable-Fe foundries, as measured by the test bar, are 51,000 lbs. and 12.5% resp. If a gray-Fe and a malleable-Fe casting are designed to perform the same function, the design of each based strictly upon its physical properties, the malleable-Fe casting can be made  $\frac{1}{3}$  lighter. If the part can be successfully cast of malleable Fe, the following statements hold true: for equal physical properties it is as cheap per raw casting, it is as cheap per machine casting, it will have a more pleasing appearance when assembled, it will be lighter in wt., transportation charges will be less, the wt. per sq. ft. on the floor will be less, breakage during transportation will be eliminated. Since most of the steel castings are unannealed and therefore show a strained structure and are coarsely cryst. while the malleable-Fe casting is fine-grained and invariably free from internal strain, a given casting of malleable Fe will stand more abuse in service than will a similar unannealed steel casting. The malleable-Fe casting is characteristically free from blowholes, and is superior to steel in rust-resisting properties. T. discusses the properties and limitations of malleable-Fe castings and the comparative costs of gray-Fe, steel and malleable-Fe castings.

V. O. HOMERBERG

**Brass and bronze castings.** C. H. BIERBAUM. *Mech. Eng.* **42**, 435-7(1920).—The precautions to be taken in specifying brass and bronze castings are discussed. The general properties and uses of Mn bronze, Al bronze, the acid-resisting bronzes, the Cu-Sn alloys, the Cu-Sn-Zn, the Cu-Sn-Pb, and the Cu-Pb-Sn-Zn alloys are considered.

V. O. HOMERBERG

**Cast iron for locomotive-cylinder parts.** C. H. STRAND. *Bur. Standards, Tech. Papers* No. 172, 25 pp.(1920).—On a basis of tests made by inspectors of the U. S. railroad administration and the Bureau, it is concluded that air-furnace or so-called "gun Fe" is more uniform in character and on the av. of somewhat better mechanical properties than cupola Fe. The latter, however, often equals or even excels in mechanical properties the specimens of air-furnace Fe tested in the investigation. The S content of the air-furnace Fe examd. seldom exceeded 0.06%, while the cupola Fe varied in S content from 0.10 to 0.17%. It was impossible, except in a general way, to find any correlation between the quality of the Fe as developed by lab. tests and the mileage obtained in service. This is explained by the fact that many other factors besides the quality of the Fe enter into consideration in the service results; namely, design, lubrication, method of handling the locomotive, etc. It is recommended that the transverse-strength requirements of  $1\frac{1}{4}$ -in. arbitration bar be increased from 3200 to 3500 lbs. for casting  $\frac{1}{2}$  in. or less in thickness, and from 3500 to 3800 lbs. for castings over  $\frac{1}{2}$  in. in thickness. It is further recommended that the minimum deflection requirements for both cases be increased from 0.09 to 0.11 in.

V. O. HOMERBERG

**Annealing of electrolytic iron.** J. CURNOT. *Compt. rend.* **171**, 170-1(1920).—Electrolytic Fe contains H as hydride, which increases the hardness. This may be removed by annealing at a fairly high temp. To det. the conditions required for its

removal, small test pieces of fresh electrolytic Fe were heated both in a fused salt bath and in a gas-fired furnace at different temps. and for varying periods of time, and the Brinell hardness of each was subsequently detd. (10 mm. ball, 1000 kg.). The two series gave identical results.

Temp of anneal.	Time of annealing							
	min. 0	min. 10	min. 20	min. 40	hrs. 1	hrs. 2	hrs. 4	hrs. 6
650°	164	161	160	161	159	155	155	155
750°	164	155	157	153	152	144	140	136
850°	164	135	120	115	107	95	92	92
950°	164	103	100	96	88	84	84	84
1050°	164	88	87	84	83	83	83	83

The test pieces were subsequently polished and etched 20 sec. in 4%  $\text{HNO}_3(\text{EtOH})$ . The grain size of the crystal structure increased with the annealing temp. From 650° to 750° the characteristic hydride structure partially disappeared and for 850° and for higher temps. wholly so. The results show that 2 hrs. at 950° or 1 hr. at 1050° is necessary for complete annealing; 4 hrs. at 850° does not suffice. The hydride structure wholly disappeared after 1 hr. at 850°, but the hardness had not then reached its minimum.

S. L. CHISHOLM

**Defects in steel originating in the ingot.** AUSTIN B. WILSON. *Chem. Met. Eng.* 23, 1161-6(1920).—The microscopic appearance of breaks and inclusions of non-metals in steel, which defects originate during pouring or solidification, is considered. Various deoxidizers and their end products are listed and briefly discussed.

V. O. HOMERBERG

**Defects arising in steel during fabrication.** AUSTIN B. WILSON. *Chem. Met. Eng.* 23, 1209-13(1920).—Localized corrosion and the defects due to improper heating are discussed. The use of cold-worked metal where important loads must be borne should be avoided. The defects during hot-working are in the form of non-uniformity of structure and laps, seams, etc., due to the partial welding of portions of the metal that have become overlapped during the rolling or forging. Another defect in this class is the rough, uneven finish caused by scale, etc., on the surface being rolled into the metal. There is a great difference not only in the structure but also in the properties of "burnt" and "overheated" steel. Steel that has been "burnt" has been heated above the point of incipient fusion and cannot be restored short of remelting. It is both "cold-short" and "red-short." Its cohesion has been destroyed, the grains being surrounded by oxidized films that effectually prevent welding. "Overheated" steel has a coarse fracture and structure and, like "burnt" steel, is extremely brittle. Unlike "burnt" steel it can, however, easily be restored by suitable heat treatment. "Overheated" steel results from long annealing at a temp. below that of incipient fusion. Nuclei of fatigue fractures are associated with P bands. Photomicrographs of changes in structure during the annealing of steel castings are included.

V. O. HOMERBERG

**K. S. magnet steel.** KOTARO HONDA AND SEIZO SAITO. *Phys. Rev.* 16, 495-500 (1920); *Science Reports Tohoku Imp. Univ.* 9, 417-22(1920); *Electrician* 85, 706-8 (1920).—See C. A. 14, 2906.

V. O. HOMERBERG

**Influence of gases on growth of cast iron under repeated heating conditions.** J. E. FLETCHER. *Engineering* 110, 747(1920).—F. conducted and obtained (in 1902 to 1907) results similar to those of Honda and Murakami (C. A. 15, 227) on the graphitization of Fe-C alloys, wherein the authors gave strong reasons for the conclusion that the mechanism of graphite formation in such alloys is due to the influence of the gas CO imprisoned within the metal, either in soln. or in the free state. F. has also shown (C. A. 14, 720) that when gray cast Fe is melted in the puddling furnace, refin-



ing actions proceed in the liquid metal until a C content of, say, 2% is reached. Below this point the furnace temp. is too low for further refining in the liquid state, and the plastic Fe crystals begin to sep. out (helped by the agitation of the puddler's rabble) from the liquid eutectiferous matrix which becomes the locality of the CO and other gases expelled from the congealing Fe crystals as they "come to nature." The resulting ball of spongy Fe is a mass of plastic Fe crystals practically gas-free, though the accompanying slag or cinder is wildly gaseous, having received the bulk of the ejected gases. In the steel-melting furnace, the refining or elimination of the metalloids proceeds throughout the operation in a liquid metal mass wherein the imprisoned gases persist and are carried forward and to some considerable extent are entrapped within the solidified ingot. In the comparatively C-free ingot steel of the "Armco" type, the presence of imprisoned gases and FeO at the crystal boundaries differentiate that material from well-worked puddled Fe. In the latter case there can be no entrapped gases to influence and intensify the dilatation incident to cast Fe and steel, thus rendering the working, rolling, drawing or forging at the allotropic change temps. free from the dangers, which accompany the plastic working of "dead-mild" steel at such temps.

V. O. HOMERBERG

**Relation of the high-temperature treatment of high-speed steel to secondary hardening and red hardness.** HOWARD SCOTT. *Bur. Standards, Sci. Papers* No. 395, 521-36(1920).—Attention is called to the importance of fundamental research applied to high-speed steel and the value of physical tests for this purpose. The effect of heat treatment on the density, hardness, microstructure, magnetic properties, and thermal characteristics of a standard brand of high-speed steel was detd. The interpretation of these data permitted the following conclusions: (1) A high-speed steel susceptible to secondary hardening is partially austenitic when quenched from a temp. high enough to produce this phenomenon. (2) The microstructure of steels hardened and tempered above 200° is similar to that of C steels, although the same nomenclature in certain cases is not permissible. (3) The behavior of the physical properties of high-speed steel on heat treatment is analogous to that of hypereutectoid C steel. (4) The following reasons are given for the use of the high heat treatment: (a) Increase of red hardness; (b) increase of initial hardness; and (c) reduction of brittleness. (5) High-speed steel should preferably be tempered for secondary hardness.

V. O. HOMERBERG

**Relation between the Brinell hardness and the grain size of annealed carbon steels.** HENRY S. RAWDON AND EMILIO JIMENO-GIL. *Bur. Standards, Sci. Papers* No. 397, 557-93(1920).—The Brinell hardness was detd. for 5 steels varying in C content from a very low value to somewhat above 1%. Each of the steels was treated so as to produce wide variations in grain size, and the hardness was detd. in each condition. Upon heating for 6-hr. periods, no very appreciable increase in the grain size occurred until Ac<sub>1</sub> transformation in the steel had taken place. The change in grain size often appeared to be a very abrupt one; that is, it takes place within a rather narrow range of temp. Two methods were used for obtaining the Brinell hardness, one of which was intended to give the hardness of individual crystals or small aggregates as distinct from the av. hardness of the material. The results of the 2 methods showed no appreciable difference between the hardness of small groups of crystals and the av. hardness for the steels investigated. Although it was impossible to obtain an accurate numerical grain-size detn. for many of the specimens, the micrographic examn. indicated that there is no simple and direct relation between grain size and Brinell hardness number for C steels. A very pronounced increase in grain size is usually accompanied by a decrease in hardness. On the whole, however, grain size appears to be a factor of minor importance in detg. the Brinell hardness of C steels of the types investigated. The general effect of heating the steel—that is, upon the

properties of the metal after cooling—is to harden it appreciably. This increase is noticeable in spite of a pronounced drop in hardness which accompanies an abrupt increase in grain size. This tendency toward hardening upon heating is not shown by low-C steels to any extent, thus suggesting that this change in hardness is not a function of the grain size. The rate at which steels are cooled, and consequently the structural condition of the hardening constituent, affect the hardness much more than any other factor. The hardness measurements upon materials in which a pronounced differential grain growth has been produced by low-temp. annealing after straining the metal are in general accord with the results obtained upon the same steels in which the grain was coarsened by heat alone. Incidental to the study of the hardness of steel coarsened by annealing after permanent strain, some data were obtained relative to the magnitude of the necessary stress required to cause pronounced grain growth upon annealing such strained metal below the  $A_{c1}$  transformation temp. V. O. H.

**Effect of depth of copper plating on carburization.** E. P. ZIMMERLI. *Mech. Eng.* 42, 565-6(1920).—The steel used had the following compn.: C 0.112, P 0.012, S 0.0365, Si 0.128, Mn 0.458%. The cyanide bath was made up as follows, the given quantities being for one l. of soln.:  $\text{Na}_2\text{SO}_3$  20 g.,  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  20 g.,  $\text{NaHSO}_3$  20 g.,  $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$  20 g., KCN (100%) 20 g. The analysis of the carburizing mixt. was as follows: Charcoal 48.70,  $\text{BaCO}_3$  10.56,  $\text{Na}_2\text{CO}_3$  4.65,  $\text{SiO}_2$  2.70,  $\text{Al}_2\text{O}_3$  33.25%. The time in the furnace at  $1700^\circ\text{F}$ . varied from 2 to 12 hrs. The current density was about 0.003 amp. per sq. cm. The expts. showed that in Cu plating with a current density as low as the one employed there is no need of using as deep a plating as is now common practice. The depth of Cu plating required for ordinary work is not over 0.0002 in., or with a 100% safety factor, 0.0004 in., and very often a lesser thickness would be sufficient. V. O. HOMERBERG

**Some notes on the effect of nitrogen in steel.** O. A. KNIGHT and H. B. NORTHRUP. *Chem. Met. Eng.* 23, 1107-11(1920).—Specimens of annealed steel wire  $1/8$  in. in diam., 10 in. in length and containing C 0.81, Mn 0.56, Si 0.17, S and P less than 0.04% were selected for treatment. Three of the 9 specimens were pulled in the annealed, untreated condition. The 6 others were treated in  $\text{NH}_3$  gas for 8 hrs. at  $650^\circ$  and furnace-cooled in ammonia gas. Three of these were tested in the tensile machine, and the other 3 were heated in H for 8 hrs. at  $650^\circ$  and furnace-cooled. They were then tested in the tensile machine. The effect of heating in  $\text{NH}_3$  diminished the tensile strength and greatly reduced the elongation, while the reduction of area was rendered zero. This low value of the tensile strength was due to the extreme brittleness of the outside hard surface, which developed circular cracks extending completely around the specimen upon the application of a few thousand lbs. per sq. in. Heating in H partly restored the normal physical properties, and no doubt prolonged heating would have restored completely the original physical properties. Heating in H did not remove the effects of the  $\text{NH}_3$  treatment as fast as they were induced. In a search for a metal that would be unaffected by  $\text{NH}_3$ , it was found that pure W did not seem to be affected by this treatment. All other pure metals tested were affected. Wrought Fe and low-C steels were readily attacked. High-C steels were much more resistant than wrought Fe and low-C steel. White cast Fe was affected on the surface, but not deeply. Cr-V steels were found to be the best. Stellite was practically unaffected, and nichrome was also little affected. Monel metal was slightly attacked. A specimen of 0.07% C steel was case-hardened and then subjected to the  $\text{NH}_3$  for 12 hrs. and furnace-cooled. The surface varied in C content from 0.07% to 1%. Upon examn. the high-C region revealed a very brittle "case," which depicted columnar crystals on its inner portion on deep etching. No change of structure was noted beneath these crystals. In the low-C area the same type and depth of "case" was observed, beneath which was a thin layer pearlitic in structure or pearlite containing

some sorbite, beneath which in turn was a layer about 2 grains in width that appeared unaffected; then followed an area containing N needles, and finally the true normal structure. It was therefore revealed upon microscopic examn. and etching with  $\text{NH}_3$  that the N liberated by decomposing  $\text{NH}_3$  under the stated conditions has a greater penetrating power on low-C than on high-C steel. Several specimens of 0.8% C were subjected to the action of  $\text{NH}_3$  and then subjected to corrosion tests. These were found more resistant to corrosion than in the case of untreated specimens, provided the specimen, after nitrogenization, was not subjected to stresses that would develop cracks in the brittle case. The N theory of the erosion of guns is considered.

V. O. HOMERBERG

**Constitution and properties of boiler tubes.** A. E. WHITE. *Mech. Eng.* **42**, 603-6(1920).—The causes of tube failure are due to tube brittleness resulting from the absorption of H by the metal and usually attributable to faulty boiler-feedwater treatment, to blowholes or other imperfections in the metal, and to recrystn. of the metal. These causes are discussed and supplemented with photomicrographs. The grain growth under temps. below the critical point is an important factor. It is thought that a C content varying between 0.30 and 0.35% will insure longer life for the tube and safer boiler operation than a C content between 0.08 and 0.18%.

V. O. H.

**Corrosive value of waters.** P. J. THIBAUT. *Australasian Chem. Met.* **3**, 14 (1920).—The corrosion value of  $\text{H}_2\text{O}$  is the amt. of Fe that a  $\text{H}_2\text{O}$  will dissolve or transform to an oxide when treated under standard conditions. The test is intended to serve as a measure of the corrosion that will take place in steam boilers. Select a glass-stoppered bottle of about 200-cc. capacity. A piece of mild steel is next machined to about  $\frac{1}{8}$  in. in width and  $\frac{1}{8}$  in. in thickness and of a length a little less than that of the bottle. The capacity of the bottle under working conditions is detd. by inserting the steel into the bottle, then filling to overflowing with distd.  $\text{H}_2\text{O}$ , then inserting the stopper. The stopper is then withdrawn, and the  $\text{H}_2\text{O}$  remaining in the bottle is transferred to a measuring cylinder, and thus the contents of the stoppered bottle with its piece of Fe is detd. The bottle is next filled with the  $\text{H}_2\text{O}$  to be tested, which must be free from solids in suspension. The Fe contents of the  $\text{H}_2\text{O}$  must be detd. The bottle is filled to overflowing, the stopper is inserted, care being taken that air bubbles are not formed. The stopper is next securely wired down. The bottle and contents are next placed in a boiler containing cold  $\text{H}_2\text{O}$  and gradually brought to the boiling point, the boiling being maintained from the time that the  $\text{H}_2\text{O}$  reaches  $100^\circ$  for a period of 6 hrs. A slight pressure is generated, and as the bottles sometimes burst it is advisable to wrap them securely in a towel. The bottle is removed from the heat and allowed to stand until cold. The  $\text{H}_2\text{O}$  in the bottle is transferred to a large beaker, the strip of Fe washed with cold distd.  $\text{H}_2\text{O}$  and any ppt. adhering to the glass bottle is removed by an acid wash that is added to the  $\text{H}_2\text{O}$  in the beaker. The Fe is detd. by a suitable method. The Fe so found—Fe in the  $\text{H}_2\text{O} \times 100 \div$  the vol. of the  $\text{H}_2\text{O}$  in the bottle = the corrosion value of the  $\text{H}_2\text{O}$ .

V. O. HOMERBERG

**New cyanide process for hardening steel.** WM. J. MERTIN. *Iron Age* **106**, 1267-8 (1920).—The process involves case hardening in a stream of CN gas evolved from a container filled with an alkali cyanide, which is heated by elec. energy or other means to accomplish the vaporization or boiling of the salt. The articles to be treated are independently heated out of contact with the fused cyanide salt. Nascent CN has a speed of penetration 4 or 5 times that of CO. A description as well as a diagram is given of a regenerative CN case hardening furnace. The advantages claimed for the process are the following: (1) Temp. control is more perfect, since the pyrometer is inserted directly into the heating chamber. (2) It gives a finer, more uniform and

a deeper case than any other process and is therefore cheaper. (3) It eliminates the use and storage of carburizers and carburizing bores. V. O. HOMERBERG

**Comparative values of motor valve steels.** G. GABRIEL. *Iron Age* 106, 1465-9 (1920).—An exhaustive analysis is given of the effects of high temp. on the physical properties of W, Cr and Ni steels. V. O. HOMERBERG

**Steel for valves of combustion motors.** G. GABRIEL. *Iron Age* 106, 1249-51 (1920).—The various ways in which valves may deteriorate are enumerated. Some of the properties that a steel must have in order to be used in the manuf. of valves for internal-combustion motors are given. V. O. HOMERBERG

**Testing hardness of bearings and journals.** C. H. BIERBAUM, J. A. CAPP AND H. DIEDERICH. *Iron Age* 106, 1727-30 (1920).—The "microcharacter" is an instrument provided with a sapphire point which is so fine that the hardness of individual crystals of steel, bearing metals, etc., can be detd. The advantages and the operation of the instrument are explained. Photomicrographs are included to show results obtained. V. O. HOMERBERG

**Zirconium is deoxidizer in cast iron.** RICHARD MOLDENKE. *Foundry* 48, 878-9 (1920).—An alloy of ferrozirconium containing 30.6% Zr was used in the tests. Small percentages behaved well in melting and indicated a purifying action, for the slag came up and collected for easy removal. The larger percentages gave more trouble and chilled the metal considerably so that it was difficult to pour successfully. A table giving the compn. of the cast Fe, the amt. of Zr added, the breaking strength and the deflection is included. V. O. HOMERBERG

**Carbonizing so as to insure a tough core.** EARL W. PIERCE AND JOHN W. ANDERSON. *Iron Age* 106, 1315-6 (1920).—A new method is explained and contrasted with one regarded as standard present practice. The advantages of the new method are enumerated. V. O. HOMERBERG

**Aluminium castings.** Z. JEFFRIES. *Mech. Eng.* 42, 427-31 (1920); cf. C. A. 14, 525.—A general discussion is made under the following sub-headings: Al alloys for castings, physical properties of Al and its alloys, general observations on Al castings, heat treatment of Al-alloy castings, effect of thickness of section on the physical properties of Al alloys, effect of rate of chill on the physical properties of Al alloys, the fatigue resistance of Al alloys, general considerations regarding the use of Al castings, and the selection of alloy. V. O. HOMERBERG

**Density of aluminium from 20° to 1000°.** JUNIUS DAVID EDWARDS AND T. A. MOORMAN. *Chem. Met. Eng.* 24, 61-4 (1921).—The density of pure, annealed Al (100% Al) is estd. to be very close to 2.700. The effect upon the density of small changes in compn. and changes in structure produced by mechanical working, etc., are discussed in the paper. A graphite densimeter has been developed for detg. the density of liquid metals and a series of detns. carried out on liquid Al of various grades. The density of liquid Al (99.75% Al) may be obtained from the following equation:  $d_4 = 2.382 - [0.000272(t - 658^\circ)]$ . The solidification shrinkage or vol. change of Al on freezing is shown to be close to 6.6%. V. O. HOMERBERG

**The magnetic properties of nickel-copper alloys.** R. GANS AND A. FONSECA. *Ann. Physik.* 61, 742-52 (1920).—(a) Contrary to the rule of Tammann, that if the solvent is a nonmagnetic metal, the alloys will not be ferromagnetic, even if the other components are, the authors find that ferromagnetic crystals, dissolved in nonmagnetic crystals form ferromagnetic alloys. (b) Cu-Ni alloys belong to the type of mixts. which show a limited mutual miscibility. This is interrupted by a region of concn., which in this example extends from about 45 to 50% Ni, and in which Cu-satd. Ni crystals, and Ni-satd. Cu crystals are present in variable proportions. This relation is also faintly indicated in the irregularity of the elec. cond. curves, and the temp. coeffs. observed by Feussner and Linbeck, on the basis of which these authors

believed in the existence of a chem. compound of formula Cu-Ni. (c) The result of thermic and micrographic analysis led Guertler and Tammann to assert an unbroken sequence of mixed crystals; this error is accounted for by the small extent of the satd. region, which can easily be passed by in the methods employed by them. (d) The present results are in agreement with the relation of Co-Cu alloys with the single exception that the break in the series of mixed crystals is in this case more extensive. Thus Ni shows relations entirely analogous to those of Co; the two metals in this regard are very similar to each other.

R. E. HALL

**The constitution diagram of the alloys of lead and barium.** J. CZOCHRALESKI AND E. RASSOW. *Z. Metallkunde* 12, 337-40(1920).—Pb-Ba alloys were studied up to 8% Ba and the equil. diagram was found to be of the eutectic type in the limited range investigated. The components of the eutectic are pure lead and a compd. which is probably  $Pb_3Ba$ . The eutectic contains about 4.5% Ba and melts at  $282^\circ$ . Microscopic examn. confirms the results of the thermic study. Photomicrographs are given.

R. S. WILLIAMS

**The recrystallization diagram of copper.** E. RASSOW AND L. VELDE. *Z. Metallkunde* 12, 369-71(1920).—The amt. of crushing to which a metal has been subjected, det. the size of the latent grain fragments formed from the larger grains. A definite relationship exists between this fragmentation, the annealing temp. and the size of the annealed grains. The relationship has been studied with pure copper with varying amts. of deformation and at different annealing temps. and the results indicated in a ternary diagram from which may be read the grain size corresponding to any reduction from 5% up to 75% and at annealing temps. from  $200^\circ$  to  $1000^\circ$ .

R. S. W.

**Some features in the behavior of beta brass when cold-rolled.** F. JOHNSON. *Engineering* 110, 882-4(1920).—See C. A. 14, 3397.

E. J. C.

**Metallic-electrode arc-welding process.** O. H. ESCHOLZ. *Mech. Eng.* 42, 572-4(1920); cf. C. A. 14, 2611.—The process and the physical properties of arc-deposited metal are considered. The present status and the trend of future activity in arc welding are summarized.

V. O. HOMERBERG

**The metal supply problem in Germany.** I, II. C. A. HEISE. *Iron Age* 106, 1295-7; 1328-30(1920).—The shortage, arising from war demands, of Cu, Sn, Pb, Ni, Al, and high-speed steel alloys are noted, together with the development of substitutes. For economic reasons, Germany will be forced to keep her Cu consumption at a minimum while the future of Pb and Zn depends upon the final disposition of the Upper Silesian territories.

W. H. BOYNTON

**Electric polisher for preparing grindings for metallography.** ANON. *Chem.-Ztg.* 44, 814(1920).—Five grinding wheels are mounted on a motor-driven shaft in such a manner that one of any desired fineness of grain may instantly be put in operation.

J. H. MOORE

**Notes on heat treatment.** P. DEJEAN. Univ. de Grenoble. *Technique moderne* 12, 410-6(1920).—A review of the principal known and exptly. proved facts relative to the heat treatment of steels, together with a discussion of the various theories to which they have given rise.

A. P.-C.

**Bearing metals and their industrial application.** J. CZOCHRALESKI. *Z. Metallkunde* 12, 371-403(1920).—Early in the war (1915) the available tin in Germany was about 4500 tons with a normal demand for bearing metals alone of 10,000 tons. Extended investigations of bearing-metal materials were, therefore, undertaken and are reported in condensed form by C. The effects of pouring temps. on the common bearing alloys are illustrated by photomicrographs with special reference to the new Pb-Ba and Pb-Ca alloys. Tables and curves show the physical properties of the alloys studied and indicate the decided advantages of the Pb-Ba bearing metals for many uses. C.

describes in detail, with drawings, the methods of making and melting bearing metals and the methods of attaching the bearing layer to bushings especially with the new alloys. Correct and incorrect methods for the seating of the shaft in the bearing in connection with lubrication are illustrated. An instrument for measuring the bearing efficiency of different metals is described. The paper is followed by an extended discussion and has many photomicrographs, charts, line drawings of furnaces and photographs of machines.

R. S. WILLIAMS

Notes on a colorimetric determination of palladium—palladium alloys for replacing platinum (HRADECKY) 7. Slushing oils (WALKER, STEELE) 26. Coating compositions (Brit. pat. 151,793) 18.

SCHWARZ, M. v.: *Legierungen*. 2nd Ed. edited by Franz Peters. Stuttgart: Ferdinand Enke. For review see *Chem. App.* 8, 12(1921).

**Flotation separation of minerals.** C. L. PERKINS. U. S. 1,364,858, Jan. 4. A mineral pulp such as Cu sulfide ore is prepd. for flotation sepn. by successive addition of a non-frothing, non-oleaginous mineral collecting agent such as diazoaminobenzene and an agent having good frothing properties such as terpineol or pine oil.

**Flotation separation of minerals.** C. L. PERKINS and R. E. SAYRE. U. S. 1,364,859, Jan. 4. Mineral pulp such as Cu sulfide and siliceous gang is treated first with alkali and thiocarbamide and then with a good frothing agent such as terpineol preparatory to flotation sepn.

**Flotation separation of minerals.** C. L. PERKINS and R. E. SAYRE. U. S. 1,364,307, Jan. 4. A small amt. of an org. N-S compd. such as dehydrothio-*p*-toluidine in soln. is added to an ore pulp, *e. g.*, Cu sulfide ore and alkali, before flotation, in order to facilitate sepn. U. S. 1,364,308 relates to the use of thiourea or a deriv. such as thiocarbamide with ore pulps to facilitate sepn. of Cu sulfide or other minerals by flotation.

**Flotation separation of minerals.** C. L. PERKINS. U. S. 1,364,304, Jan. 4. Mineral pulps such as sulfide ores are mixed with diazoaminobenzene or other azo or diazo compds. preliminary to flotation sepn. in order to facilitate flotation of ores of Cu sulfides or similar minerals. U. S. 1,364,305 relates to the use of diazoaminotoluene and related compds. for the same purpose. U. S. 1,364,306 specifies the use of a hydrazine compd. such as phenylhydrazine or naphthylhydrazine with ore pulps in order to facilitate sepn. of Cu sulfide ore ground with H<sub>2</sub>O and NaOH. Terpineol or pine oil may be used as a frothing agent.

**Ore-concentrating device.** ARCHIE H. JONES. Can. 207,863, Jan. 25, 1921. The app. comprizes an upright conduit with means for admitting ore pulp at its lower end and a free annular overflow at its upper end, an unobstructed annular perforated medium surrounding the conduit and adapted to receive the overflow therefrom, means for mechanically agitating the ore pulp within the conduit and discharging it with an outward swirl upon the perforated medium and means for forcing air through the perforated medium into the pulp.

**Machines for concentrating ores.** JNO. M. STADEL. Can. 208,023, Jan. 25, 1921. The app. comprizes a container having an inclined bed, means for delivering oil and water to the upper portion of the bed, a hopper for pulverized ore, a rotary brush to feed ore from the hopper to the liquid on the bed, a skimming device at the lower end of the bed and a conduit for receiving liquid from the skimming device.

**Eliminating volatile materials and gases from ores or similar materials.** S. L. BOGGS. U. S. 1,363,387, Dec. 28. Volatile materials and gases are removed from ore, clay or dolomite or similar materials, preparatory to forming molded articles by roast-

ing the material, crushing and pulverizing it and then agitating it in a mixt. of  $H_2O$  and alum. This obviates breakage of the product from expansion (*e. g.*, in furnace linings).

**Ore separator.** E. F. COLDWELL. U. S. 1,363,760, Dec. 28.

**Apparatus for washing, sizing and concentrating black sands and the metals which they carry.** T. A. ROGERS and J. E. REID. U. S. 1,363,207, Dec. 21.

**Apparatus for washing and lixiviating granular or powdered ore.** G. GRÖNDAL. U. S. 1,363,970, Dec. 28.

**Extracting copper from ore.** ROBERT S. EDWARDS. Can. 208,009, Jan. 25, 1921. A mixt. of Cu-bearing material, an excess of NaCl and a hydrated base is heated to not less than  $1000^\circ F.$ , the CuCl evolved is collected with a water spray and the Cu recovered by electrolysis. Cf. C. A. 14, 43.

**Extraction of copper and nickel from low-grade ores.** W. BORCHERS and H. PEDERSEN. Can. 207,475, Jan. 11, 1921. Cu-Ni mat. is roasted and leached with acidulated water. Cu is pptd. with  $H_2S$  and the ppt. is reduced to metallic Cu, the residual  $NiSO_4$  soln. is evapd., the  $NiSO_4$  roasted to form NiO which is then reduced to metallic form.

**Extracting molybdenum and other metal oxides from ores.** F. D. S. ROBERTSON. Can. 207,908, Jan. 25, 1921. Molybdenite is heated in an oxidizing gas current to a temp. high enough to oxidize the  $MoS_2$  and volatilize the oxide, the fume is passed through a collector to deposit the  $MoO_3$ , at least part of the gases from the collector are returned into contact with more heated  $MoS_2$  to pick up more oxide and sufficient O is introduced into the gas current to maintain its oxidizing character. Cf. C. A. 14, 3766.

**Separation of molybdenum ores.** T. R. FORLAND. Can. 207,832, Jan. 25, 1921. A current of Cl gas at above  $268^\circ$  is passed in contact with  $MoS_2$  and the resulting vapors of chloride of Mo are condensed.

**Reducing metals en masse.** T. W. MUCKLE. U. S. 1,363,188, Dec. 21. A mass of metal or ore for reduction is heated in a furnace by the action of flames projected into the furnace and supplying highly heated deoxidized combustion gases to the charge. Malleable Fe may be thus prepd.

**Reduction of metallic-oxide ores.** JAS. W. MOFFAT. Can. 207,431, Jan. 11, 1921. Finely divided oxide ores are fed into the upper part of an air-tight furnace and heated in the presence of a reducing gas, the ore being constantly lifted and dropped through the gas in such a manner that the ore particles are individually and repeatedly presented to the action of the gas without movement longitudinally in the furnace and until the O is practically all removed and then withdrawing the reduced ore at the bottom of the chamber. The product is ready for smelting in an elec. furnace. App. for so treating the ore is also specified.

**Treating complex ores.** H. J. E. HAMILTON. Brit. 152,289, Oct. 8, 1920. Complex ores or their products are roasted with an alkali chloride at about  $400^\circ$  or lower with access of air so as selectively to chloridize the Pb and Ag or at similar or higher temps. so as to chloridize all the metals, and the product is then leached with hot alkali chloride soln. to dissolve the Pb and some Ag, and afterwards, if desired, with a soln. of  $Na_2S_2O_3$  to ext. the Ag. The first leaching soln. is treated with metallic Zn, galvanized Fe, Al or the like to obtain the Pb and Ag, and the deposited metal may be compressed under  $H_2O$  to avoid oxidation, and is finally melted down. The second leaching soln. is mixed with a NaCl soln. and similarly treated to obtain a richer argentiferous Pb; or the metals may be obtained from both solns. electrolytically. The residue from the leaching is treated by the "acid-oil froth process" to obtain a Zn concentrate.

**Treating zinc and other ores.** METALS EXTRACTION CORPORATION. Brit. 152,029, Oct. 6, 1920. Sulfide, carbonate, silicate or other ores, roasted or not, are mixed with a

binder, preferably one capable of yielding a coked mass such as starch paste and with or without a reducing agent such as powdered coal and spread upon pieces of refractory material such as slag, for instance by mixing the pasty mixt. and the slag pieces in a pug mill. The pieces coated with the paste are placed on a bed of fuel on a grate. Air is sucked through the charge by a fan, and subsequently air is blown in from a blower. The metal is reduced to the metallic state and vaporizes, a sepn. being thus effected between volatile and less volatile metals, and the fume may be condensed as metal or an excess of air may be employed to obtain oxide. The invention is described with reference to the production of ZnO from Zn ores.

**Treating lead and silver ores.** F. E. ELMORE. Brit. 151,698, June 23, 1919. In a process of the kind described in 127,641 (C. A. 13, 2332), in which Pb-Zn sulfide ores containing Ag are treated with brine or the like and an acid such as HCl, H<sub>2</sub>SO<sub>4</sub>, or alkali bisulfate for dissolving the Pb and Ag and leaving the ZnS unattacked, the soly. of the Ag is increased by a suitable heat treatment of the ore or of the residual ZnS when containing Ag. The heat treatment may be a simple heating in a closed vessel or in an open vessel in contact with air, or in a neutral or reducing atm. such as CO<sub>2</sub>, CO, H, and N, temps. of 400–700° being mentioned, the time of heating being about 1 hr. Alternatively, the heat treatment may be effected in the presence of a reagent which acts upon some or all of the PbS, for instance, a halogen salt such as NaCl in the presence of an oxidizing gas at a temp. above 400°, (and in this case the temp. may be high enough to volatilize some of the Pb as chloride or oxychloride), the conditions, however, being such that the ZnS remains for the most part undecomposed; a temp. of 861° is mentioned in this connection. The solvents mentioned are NaCl, MgCl<sub>2</sub> or CaCl<sub>2</sub> containing HCl or a salt such as CnCl<sub>2</sub>, or both. Cf. 129, 773 (C. A. 13, 2980).

**Silver and lead chlorides.** AMALGAMATED ZINC (DE BAVAY'S) LTD. Brit. 151,952, Oct. 2, 1920. In the treatment of complex sulfide ores in which the ore is treated so as to chloridize the Pb and Ag but not the Zn, for instance by heating with ZnCl<sub>2</sub>, it is leached with cold brine acidulated with HCl (and satd. with PbCl<sub>2</sub> if desired) to ext. the Ag, and then with hot neutral brine to ext. the Pb.

**Sulfatizing metal sulfides.** J. G. AARTS and C. J. G. AARTS. Can. 207,771, Jan. 25, 1921. Sulfide ores are sulfated by roasting the material at 900° and then subjecting the material to the action of O-containing roast gases at a gradually decreasing temp., the gases moving in parallel with the material. Oxide ores may be similarly treated with the addition of S or pyrites.

**Metallurgical process.** JNO. T. JONES. Can. 207,228, Jan. 4, 1921. Finely divided ore containing Fe and Mn are mixed with finely divided carbonaceous material and heated to about 2000° F. in the absence of air to coke the carbonaceous material and reduce the Fe to the metallic state. The Fe is sepd. out and the Mn reduced to the metallic state.

**Separating iron and nickel from copper mats.** W. BORCHERS. Can. 207,476, Jan. 11, 1921. Mat is smelted with lime in a furnace lined with carbonaceous reducing material, the Fe and Ni sulfides are first reduced to a considerable extent, then ferro-Ni is formed with the addition of more C.

**Treating sulfide ores.** G. MOORE. U. S. 1,364,573, Jan. 4. Sulfide ores are heated with H<sub>2</sub>SO<sub>4</sub> and ozonized air, the SO<sub>2</sub> evolved is converted into H<sub>2</sub>SO<sub>4</sub> and the latter is used for treating fresh batches of ore.

**Apparatus for recovering tin or solder from scrap and waste tinware.** E. J. LOVGROVE. U. S. 1,363,332, Dec. 28. Hot flue gases are passed in contact with the metal to melt off Sn or other metal of low m. p. to be recovered.

**Reduction furnace and collection device.** H. PAPE. Can. 207,286, Jan. 4, 1921. Molten material is continuously run off from a reduction furnace into a collecting device



in which the material is kept molten by playing on it with a hot flame. App. is also specified.

**Furnace for annealing steel plates, etc.** T. J. COSTELLO. U. S. reissue 15,011, Dec. 21. Original pat. 1,336,681; *C. A.* 14, 1656.

**Stirring device for mechanical roasting furnaces.** ARTHUR RAMEN. Can. 207,905, Jan. 25, 1921.

**Blowpipe for blast furnaces.** E. L. IVES. U. S. 1,362,702, Dec. 21.

**Casting oxidizable metals.** H. E. BAKKEN. U. S. 1,363,384, Dec. 28. In casting readily oxidizable metals such as "misch-metal," Ce or La, a mold is used composed of sand which has been freed from  $H_2O$  and rendered moldable by addition of a non-aq. liquid such as heavy hydrocarbon oil in order to prevent oxidation of the metal during casting.

**Armor-piercing projectiles.** R. A. HADFIELD, A. G. M. JACK, I. B. MILNE and E. MORSE. U. S. 1,363,467, Dec. 28. An alloy steel projectile cap is heated and then quenched and hardened throughout its entire length and the rear end portion is then heated while the point is kept relatively cool to temper the cap.

**Piercing-mill guide.** H. McQUAID. U. S. 1,362,719, Dec. 21. Direct furnace iron is used for the manuf. of piercing-mill guides. Guides made of this material are very durable. The iron may contain total C 3, Mn 0.4, P 0.072, S 0.08 and Si 0.60%.

**Alloying or coating aluminium with other metals.** O. F. REINHOLD. U. S. 1,362,739, Dec. 21. Al plates may be coated with Pb chloride and urea. When this mixt. is heated on the Al, the Pb forms a firmly adherent coating in which any Al which may penetrate the coating is rendered passive and not readily oxidizable. Plates of this kind may be used in making grids of storage batteries or containers for acids or other corrosive liquids which would attack Al. Instead of urea, it is suggested that other similar amino compds. might be used.

**Composition for tempering metals.** A. S. CARLSON. U. S. 1,362,924, Dec. 21. A compn. adapted for tempering and toughening steel tools is formed of HOAc 15 lbs.,  $KNO_3$  2 lbs., and  $H_2O$  7.5 gals.

**Apparatus and method for tempering springs.** G. R. LANG. U. S. 1,362,708, Dec. 21. After heating and forming, the spring is treated to a quantity of liquid such as oil regulated so as to produce a partial cooling to a predetd. degree, avoiding need of reheating before final cooling in air.

**Press mold for use in the manufacture of metallic bars from finely divided powders.** K. GLADITZ. Can. 207,284, Jan. 4, 1921.

**Manufacture of iron and steel.** S. WHYTE. Can. 207,197, Jan. 4, 1921. Si is eliminated from cast Fe by heating the Fe with borax and C preferably in the form of graphite. Air may be blown into the molten mass.

**Smelting iron.** T. ROUSE. Brit. 152,073, July 2, 1919. A ferro-borosilicate soln. used in agglomerating Fe ores, etc., contains 10% of a concd. silicate soln. containing 3-4% of  $Fe_2O_3$  and 5-8% of calcined borax; oxide of Mn, and carbonaceous and slag-forming materials may also be included in the charge. The reduction is preferably effected in a gas-fired open-hearth furnace fitted with electrodes so that the later stages of the process may continue under the heating action of 3-phase current. The electrodes may be formed of metallic particles rich in Ti which contributes towards the improvement of the product. Alloys of Ni, Mg, Cr, Al, W, etc., may be added at any stage. Cf. 21,563, 1910, and 124,262 (*C. A.* 13, 1625).

**Coating iron surfaces.** K. FRIEDRICH. Brit. 152,651, Oct. 18, 1920. Fe surfaces after being cleaned and moistened are painted with a compn. of portland cement, sand, and  $H_2O$ . While this layer is still moist, a second coating is sprayed on, which consists of finely sifted cement mixed with  $H_2O$ , with the addition of bituminous bodies which have been freed from volatile oils and oxidized in presence of alkalis.

Protecting iron alloyed with a high percentage of silicon, manganese, phosphorus or like ingredients. FRITZ GREINER. Can. 207,285, Jan. 4, 1921. Fe alloys are protected during smelting by coating the fragmentary or pulverized alloy with a fire-proof envelope of calcareous material; the material may be briqueted.

Tempering steel, etc. C. W. STOPFORD and C. R. DARLING. Brit. 152,501, Sept. 23, 1919. An app. for indicating demagnetization temp. of Fe and steel prior to quenching, comprizes a moving soft Fe member arranged within a coil and adapted to displace one of a pair of resilient arms and so break a circuit containing a bell or other indicator. A suitable construction is specified.

Straightening steel rails. E. F. KENNEY. U. S. 1,363,601, Dec. 28. Rails are rolled and finished at the usual red heat, then allowed to cool to about 260–540°, and slightly cambered while at this temp. by a roller machine or other device so that when cold they are substantially straight.

Alloys. H. KAISER. Can. 207,290, Jan. 4, 1921. Alloys having high m. p. and ductile properties are produced from such metals as Cr, V, W, Th, Zr and Ru by adding one metal to another which is used as a base and adding a small amt. of a second metal which has a catalytic action before sintering the mixt.

Producing alloys free from oxygen. J. P. AREND. U. S. 1,363,382, Dec. 28. Can. 207,281, Jan. 4, 1921. In order to produce alloys of Cu or similar metals free from O, the alloying materials are treated with a reducing slag containing alkali manganosilicates during the melting-down operation.

Alloys. CYCLOPS STEEL CO. Brit. 151,981, Sept. 7, 1920. A steel alloy having corrosion-resisting properties comprizes Fe of low C content, Si, and Zr or other metal of the C group, the % of Si and Zr together being preferably about 2. Cr, or Cr, Ni and Mn may be added, the % of Cr being about 3–7, and of Ni about 5–20. In some cases about 0.3% of Cu may be added.

Alloys. B. A. BANGERTER. Brit. 152,277, Apr. 12, 1920. An alloy, particularly for jewelers' use, consists of  $3\frac{1}{4}$  parts of standard Ag, and 1 part of 12-carat Au.

Zinc alloy. A. TEDESCO. U. S. 1,364,654, Jan. 4. An alloy which is of fine grain and readily machined is formed of Zn over 85%, Cu 2–8%, Al 2.5–7.1%, Ni 0.5–8%, Mn 0.3–0.9%, Fe 0.5–1.9%, Cd 0.3–0.7 and Zr 1.2–2.5%.

Manganese alloys. B. M. S. KALLING and S. D. DANIELL. U. S. 1,363,657, Dec. 28. A Mn alloy with a low content of C and Si is prepd. from a Mn alloy high in Si by oxidation of the molten material with free O (or air) preferably at a high temp. as in a Bessemer converter.

Iron-manganese alloy steel. R. A. HANFIELD. U. S. 1,362,788, Dec. 21. An Fe-Mn alloy steel is formed containing 0.2–0.6% of C and 1.4–3.5% of Mn. An alloy of this compn. is highly resistant to tensile and shock stresses.

Rust-resisting iron alloy. G. H. CHARLS. U. S. 1,363,564, Dec. 28. A rust-resisting alloy adapted for the manuf. of sheets is formed of Fe or steel with Cu 0.20% or less and Mo about 0.10%.

Producing alloys stable against strong acids. W. and R. BÖRCHERS. Can. 207,477, Jan. 11, 1921. The acid-resisting power of metals of the Fe group is improved by alloying therewith 30–40% of Cr and about 5% of another metal of the Cr group.

Chromium and its alloys. W. B. BALLANTINE. Brit. 152,399, July 9, 1919. A process for obtaining Cr from  $\text{Cr}_2\text{O}_3$  or a mineral such as chromite, for the production of chrome-iron or chrome-steel alloys comprizes the thermoreduction of the oxide of Cr with  $\text{CaC}_2$  in the presence of an alk. earth oxide, with or without the presence also in the mixt. of one or more other reducing agents such as  $\text{CaSi}$  or Al. The alk. earth oxide is preferably present in proportion at least equal molecularly to that of the  $\text{CaC}_2$ . The reaction may be carried out within molten steel and the mixt. may be inclosed in thin sheet-iron cases to be immersed in the molten steel.

**Steel alloys.** BRITISH THOMSON-HOUSTON CO. Brit. 152,371, June 5, 1918. Nb is incorporated in steel alloys, particularly in combination with one or more other metals such as Ta, W, V, Cr, Mo, or U. Nb or Nb and Ta, or a ferro-alloy of Nb or of both metals, may be added directly to the steel bath, or the desired % of W, Mo, Cr, and V, Nb or Nb and Ta with or without other metals, may be reduced from ores or concentrates in the presence of Fe. The alloys may contain about 3-6% of Nb and 6-10% of W, or 2-4% of Nb, 3-6% of Ta, and 4-8% of W.

**Alloys for castings.** H. TERRISSE and M. LEVY. Brit. 151,974, Aug. 3, 1920. Acid-proof castings are made from alloys of Fe and Si and one or more metals such as W or Va for increasing the mechanical resistance. The alloys may be made by adding ferrotungsten, ferrovanadium, W silicide, or V silicide to molten ferrosilicon.

**Soldering aluminium, etc.** A. J. ANSELL. Brit. 152,486, Sept. 8, 1919. A solder for Al or its alloys is made from 6 lbs. of Sn, 2 lbs. of Zn, 1 1/4 lbs. of Al, 3/4 lb. of Pb and 1/4 lb. of an alloy of equal parts of Cu and Al. The ingredients are melted in a graphite crucible with cryolite and LiF, and the product is fluxed with MnCl<sub>2</sub> and run into bars. In use, the solder is applied to the heated Al surface; the coated surface may then be united to another similarly treated surface, or may be soldered by means of ordinary soft solder.

**Protecting nichrome tubes used at high temperatures.** F. G. MEYZOER. U. S. 1,363,428, Dec. 28. Nichrome tubes are internally coated with Ni to protect them from deterioration when used for reactions at high temps. such as in producing NaCN from Na<sub>2</sub>CO<sub>3</sub>, N, C and Fe.

**Composition for protecting metals from rust.** G. S. MORGAN. U. S. 1,364,134, Jan. 4. A mixt. adapted for use on Fe, steel or brass to prevent rusting is formed of PbO 1, fatty acids 2 and paraffin oil 60-200 parts.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER

**The oxidation of aliphatic hydrocarbons with nitrogen dioxide.** CH. GRÄNACHER. *Helvetica Chim. Acta* 3, 721-37(1920).—The different methods that have been used for the oxidation of hydrocarbons are carefully reviewed and references given. G. has studied the oxidation with a mixt. of air and NO<sub>2</sub> and with NO<sub>2</sub> alone. He has found it possible to get almost complete conversion of paraffin into alk.-sol. products without excessive decompn. or appreciable darkening. The oxidation of paraffin by this method is compared to the oxidation of hendecane; the former runs smoothly and almost completely, while the latter goes slowly and only partially. G. concludes from this that the paraffins consist chiefly of forked hydrocarbons. Paraffin gives under the best conditions nearly an equal wt. of oxidation product consisting of small amts. of unchanged paraffin, 10-20% of sol. acids and the remainder a mixt. of acids with a neutral equiv. of about 200; hendecane gives chiefly a mixt. of lower acids as would be expected in a mol. where the hydrogens on so many carbons are equally susceptible to attack. The expts. were carried on by warming NO<sub>2</sub> in a pressure flask to 40° and leading the gas first through a paraffin bubbler to control the flow of the stream into a reaction flask holding the paraffin. Mechanical stirring is necessary with temps. as low as 110-30° but not with temps. of 130-50°. The outflowing gases were led through a condenser, to collect the acids, H<sub>2</sub>O and HNO<sub>3</sub>, and then through Ba(OH)<sub>2</sub>. Several expts. are described using air with 2% of NO<sub>2</sub> on paraffin (m. 50-2°) at temps. between 110-50°. The best oxidation was obtained at 140°, the oxidation requiring at this point 5-6 days. The chief expts. consisted in using pure NO<sub>2</sub> led through a capillary into the paraffin or the hendecane at 140°. The effluent

gases consisted chiefly of NO with traces of CO, HCN and N<sub>2</sub>. The oxidation product was treated with alkali, filtered from unchanged hydrocarbon, the alk. soln. acidified and the mixt. of acids obtained worked up in the usual way. Under these conditions, running the reaction for 8–10 hrs., the paraffin was practically completely oxidized, whereas the hendecane was not more than 60% changed. Hendecane was made by reduction of Me nonyl ketone (from oil of rue) as follows: 100 g. of ketone and 200 cc. concd. HCl were added with stirring to 500 g. of granulated Zn (which had previously been treated for 0.25 hr. with 1 l. of 5% HgCl<sub>2</sub>). The mixt. was warmed over a free flame and acid gradually added during 8–10 hrs., till the oil was completely colorless. After sepn. and purification with H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O, then Na, a product b. 193–4° was obtained.

ROGER ADAMS

**Camphor.** L. Ruzicka. *Helvetica Chim. Acta* 3, 748–55(1920).—*I. Direct synthesis of pure Bornylene.* The methods so far used in the camphor series for the splitting out of water or halogen acid to give olefin derivs. in every case lead to rearrangements and thus yield impure products. R. finds that the application of Hoffmann's exhaustive methylation and decompn. of the quaternary ammonium hydroxides gives pure unsatd. hydrocarbons. In this way bornylamine (A) was converted to bornyltrimethylammonium iodide (B), then to bornyltrimethylammonium hydroxide (C) which in turn by decompn. gave camphene-free bornylene (D) and bornyldimethylamine (E). A was prepd. according to Leuckart (*Ann.* 269, 347(1892)) and the HCl salt as obtained treated with NaOEt and MeI in EtOH to give B, m. 245° (*J. Chem. Soc.* 75, 945(1899)). B was also produced from E and MeI. E, b. 210–2°, was produced by heating the HCl salt of A with 4 times its wt. of 35% aq. HCHO in an autoclave at 130°, making alk. and extg. with Et<sub>2</sub>O. B in concd. aq. soln. when shaken for 1 hr. with Ag<sub>2</sub>O, then filtered and evapd. *in vacuo* at 30°, gave a thick sirup of E. When E was heated under 1/8 mm., it solidified and decompd. at about 200° (10 g. required 2 hrs. for complete decompn.). The distillate was condensed with CO<sub>2</sub> snow and Et<sub>2</sub>O and treated with HOAc to remove any E; the D produced, filtered and dried in Et<sub>2</sub>O over Na, m. 111–2°. D with KMnO<sub>4</sub> gave *d*-camphoric acid. The basic product extd. with HOAc was obtained by adding NaOH, extg. with Et<sub>2</sub>O, evapp. and treating with MeI; in this way *isobornyltrimethylammonium iodide*, white crystals m. 278–9°, was obtained isomeric with B. *II. The sodium condensation of bromocamphoric acid ester.* The methods already attempted for forming bi- and tri-cyclic systems in the terpene series have failed for the most part on account of the high temp. necessary. The Na condensation for producing bicyclic terpenes, however, can be used very satisfactorily as shown by conversion of homocamphoric acid ester (A) by Na into camphocarboxylic ester (B) and this into camphor. B was produced by the method of Roser (*Ber.* 18, 3113(1885), 24, 3391(1891)) and used for the prepn. of A as follows: 14 g. B and 1.4 g. Na in 90 cc. abs. EtOH were heated in an autoclave at 200° for 24 hrs., then weakly acidified with HOAc, the EtOH distd. off, the residue boiled with concd. HCl, then concd. on a H<sub>2</sub>O bath, the residue extd. with aq. NaOH, shaken with Et<sub>2</sub>O and steam led through the alk. soln. to sep. traces of camphor; on acidification of the alk. soln., pure camphoric ester acid (C), m. 75°, was formed in 60% yield. C when boiled with 5 times its wt. of 20% abs. EtOH soln. of H<sub>2</sub>SO<sub>4</sub> went quant. to A. To convert A to B, then to camphor, 4 g. of A was refluxed 4 hrs. with 0.45 g. Na and 6 cc. xylene; the gelatinous mass was treated with dil. HCl and Et<sub>2</sub>O and the mixed Et<sub>2</sub>O and xylene sepd. and evapd. at 100° to dryness; the residue of B was boiled under a reflux for 5 hrs. with concd. HCl, when *d*-camphor sepd. in the condenser and the rest was obtained by steam distn.

ROGER ADAMS

**The action of cupric chloride on organometallic derivatives of magnesium.** EUSTACE EBENEZER TURNER. *J. Proc. Royal Soc. N. S. Wales* 54, 37–9(1920).—Both anhydrous CrCl<sub>3</sub> (C. A. 8, 2361) and anhydrous CuCl<sub>2</sub> (C. A. 13, 2015) react

with  $\text{PhMgBr}$  in  $\text{Et}_2\text{O}$  to give good yields of  $\text{PhPh}$ . The  $\text{CrCl}_3$  with  $o\text{-MeC}_6\text{H}_4\text{MgBr}$  gives very small yields of bi-*o*-tolyl but it is shown in this paper that  $\text{CuCl}_2$  gives 30% yields. 60 g. of  $\text{CuCl}_2$  was added gradually to the Grignard reagent from 51.3 g.  $o\text{-BrC}_6\text{H}_4\text{Me}$ , 7.3 g.  $\text{Mg}$  and 200 cc.  $\text{Et}_2\text{O}$ . After the vigorous reaction stopped, the mixt. was heated several hrs., decompd. with dil. acid, extd. with  $\text{Et}_2\text{O}$ , this ext. dried and distd. A 30% yield of bi-*o*-tolyl resulted. 19.5 g.  $\text{EtCHBrCO}_2\text{Et}$  and 2.43 g.  $\text{Mg}$  were mixed in 200 cc.  $\text{Et}_2\text{O}$ ; when the reaction stopped, 20 g. of  $\text{CuCl}_2$  was added. After decompg. in the usual way 3.5 g. of  $(\text{EtCHCO}_2\text{Et})_2$  was obtained. R. ADAMS

**Ethylene isomerism of styrenes brominated in the side chain.** CHARLES DUFRAISSE. *Compt. rend.* 171, 960-3(1920).—Hitherto only 2 styrenes containing a Br atom in the side chain have been discovered. The first of these (A) was obtained by the decompn. of dibromohydrocinnamic acid, the best procedure being that used by Nef (*Ann.* 308, 267(1899)) who prepd. it by the action of heat on the aq. Na salt soln. in the presence of  $\text{Na}_2\text{CO}_3$ . It is an oil, always yellow,  $b_p$  107°. The second compd. (B) apparently has not been prepd. in a pure state. The ease with which it oxidizes in the air caused difficulty in purifying the compd. The method adopted by D. was a modification of Nef's procedure. Dry  $\text{HBr}$  was added to a cold well-stirred soln. ( $\text{AcOH}$ ) of  $\text{PhC}\equiv\text{CH}$ . B is pptd. by adding ice, and is then washed, dried, and distd. *in vacuo*.  $\text{MeCOPh}$  and higher brominated products are not produced. It is a yellow oil, having an aromatic odor,  $b_p$  71°. The third compd. (C)—hitherto unknown—was obtained by the action of  $\text{NaOH}$  on  $\text{BrC}_6\text{H}_4\text{CH}:\text{CHCOPh}$ , the resulting products being C and  $\text{BzONa}$ .  $\text{PhC}\equiv\text{CH}$  is formed but may be removed in a vacuum. C is formed in a pure state as a colorless oil of empyreumatic odor,  $b_p$  71°,  $d_{20}$  1.426,  $n_D^{20}$  1.5990. A, B and C are distinct compds. A mixt. of any 2 of them melts at a lower temp. than the lower melting component of the mixt. Two of them are the  $\omega$ -bromostyrolenes and the third is  $\alpha$ -bromostyrene. Each compd. loses  $\text{HBr}$  under the action of alc.  $\text{KOH}$ , giving  $\text{PhC}\equiv\text{CH}$ . A and C with  $\text{Br}$  give the same tri- $\text{Br}$  deriv., m. 38°, whereas B yields a tribromo derivative, an oil which decompd. on distn. and which after several crystns. from  $\text{MeOH}$  m. 5°. A and C are therefore stereoisomers and correspond to the formula  $\text{PhCH}:\text{CHBr}$  and B to the formula  $\text{PhCBr}:\text{CH}_2$ . H. E. WILLIAMS

**Catalytic dehydration of amyl alcohol of fermentation.** J. B. SENDERENS. *Compt. rend.* 171, 918-9(1920); cf. C. A. 6, 1607.—The dehydration by  $\text{ZnCl}_2$  of amyl alc. of fermentation, b. 129-32°, a. mixt. composed mainly of  $\text{Me}_2\text{CHCH}_2\text{CH}_2\text{OH}$  and  $\text{MeCHEtCH}_2\text{OH}$ , is still thought by some to proceed according to theory with the formation of  $\text{Me}_2\text{CHCH}:\text{CH}_2$  (A) and  $\text{EtMeC}:\text{CH}_2$  (B). Wischnegradsky (*Compt. rend.* 86, 973(1878); *Bull. soc. chim.* 1, 261, 452(1877); 2, 1340(1892)) has shown that the principal product of the dehydration in the presence of  $\text{ZnCl}_2$  is  $\text{Me}_2\text{C}:\text{CHMe}$  (C), b. 36.5-7.5°, sol. in dil.  $\text{H}_2\text{SO}_4$  (2 vols. acid:1 vol.  $\text{H}_2\text{O}$ ), yielding on hydrolysis  $\text{Me}_2\text{C}(\text{OH})\text{Et}$ . S. now finds that, on passing the  $\text{AmOH}$  of fermentation at a rate of 50-5 cc. per hr. through a Cu tube heated to 340-50° and containing an Al silicate catalyst, the unsatd. hydrocarbons formed by the dehydration average 85% B and C and the remainder A. The analyses of the products were first made by fractionation with a Vigreux column and later confirmed by the soly. in dil.  $\text{H}_2\text{SO}_4$ , B and C being sol. at ca. 0°, while A remains undissolved. As the catalysis progresses, the relative proportions of A, B and C formed change. A. T. FRASCATI

**Spectrochemical studies of the  $\alpha$ -allyl- and  $\alpha$ -allylmethylcyclohexanones.** R. CORNUBERT. *Compt. rend.* 171, 919-21(1920); cf. C. A. 14, 2783.—The spectrochem. const. of the  $\alpha$ -allylcyclohexanones,  $\alpha$ -propylcyclohexanones and a certain number of alcs. derived therefrom, described previously by C. (cf. C. A. 8, 3011 and 3289), have been detd. Two generalizations are pointed out: (1) that, as a nearly general rule, when the ketones are classed according to the number of  $\alpha$ -alkyl groups present,

the variation of the  $d$ . alternates, and (2) that the exaltation of  $n$  is less for the 3rd member of each series. In the case of cyclohexanone and its  $\alpha$ - and  $\gamma$ -Me homologs, the introduction of a 2nd alkyl group in the  $\alpha$ -position produces a certain depression in its mol. refractivity, this lowering being more or less accentuated at the 4th alkylation, the 3rd being without appreciable influence. The dialkyl derivs. of the 3 series studied containing what C. calls a "*groupe double*," i. e.,  $>\text{CRR}'$ , showed a depression in the mol. refraction while the formation of a simple  $>\text{CHR}$  group had no detectable influence on its value. This observation is in conformity with the theory of v. Auwers on the double groups (gem. Dialkylgruppen), according to which those compds. containing 2 alkyl groups attached to the same C atom show a lowering of the mol. refraction, the  $>\text{CMe}_2$  group being an exception (cf. C. A. 6, 72; 7, 1505, 1507; 9, 2871). A table of the values of  $d_D^{25}$  and  $n_D^{25}$  for the compds. examd. is given.

A. T. FRASCATI

**The transformation of ammonia into urea.** C. MATIGNON and M. FRÉJACQUES. *Compt. rend.* 171, 1003-5(1920).—The economical transformation of  $\text{NH}_3$  into urea is a problem of both great industrial and agricultural interest. M. and F. have taken the reaction, (a)  $\text{NH}_4\text{CO}_2\text{NH}_4 \rightleftharpoons \text{CO}(\text{NH}_2)_2 + \text{H}_2\text{O}$  already shown to be reversible by Fichter and Becker (C. A. 6, 750), and have studied it both from a static and kinetic point of view. The reaction is not as simple as it first appears, for the  $\text{H}_2\text{O}$  formed reacts upon the undecompd. carbonate giving rise to four other simultaneous secondary reactions: (b)  $\text{NH}_4\text{CO}_2\text{NH}_4 + \text{H}_2\text{O} = (\text{NH}_4)_2\text{CO}_3$ ; (c)  $(\text{NH}_4)_2\text{CO}_3 = \text{NH}_4\text{HCO}_3 + \text{NH}_3$ ; (d)  $\text{NH}_4\text{HCO}_3 = \text{CO}_2 + \text{H}_2\text{O} + \text{NH}_3$ ; (e)  $(\text{NH}_4)_2\text{CO}_3 = \text{CO}_2 + \text{H}_2\text{O} + 2\text{NH}_3$ . Hence, the equil. pressures observed for such a system formed by placing the carbonate in a closed space of such vol. that the vol. occupied by the gaseous phase was as small as possible and could be neglected without introducing great error in the measurements, were found to be greater than those calcd. from the dissociation pressure of the carbonate plus the aq. vapor tension at the particular temp. of the expt. Thus, at  $150^\circ$ , the calcd. value was 44.1 atm., while the equil. pressure observed was 55.09 atm., the increase being explained by the simultaneous secondary reactions taking place. In the following the first figures denote the temps. and the second figures give the max. pressures measured in atms.:  $100^\circ$ , 9.03;  $122^\circ$ , 20.95;  $135^\circ$ , 33.14;  $150^\circ$ , 55.09. From the above data, the formula  $\log p = -1511/T + 5.6 \log T - 9.4$  was obtained which expresses these values in atms. The exptl. details are to be published later.

A. T. FRASCATI

**The rotary power of tartaric and malic acids in solution.** R. DE MALLEMANN. *Compt. rend.* 171, 950-2(1920).—For dil. solns.  $\alpha$  is a linear function of the concn. for any single wave length. The dispersion is normal, for all rotations of  $d$ -comps., e. g.,  $d$ -tartaric acid, are positive. In concd. soln. the curve falls off. This is especially marked as the wave length approaches the violet, thus the dispersion is abnormal. Solns. of  $d$ -tartaric acid in alc. and benzene give a negative rotation but normal dispersion. Addition of  $\text{CaCl}_2$  to aq. solns. of  $d$ -tartaric acid in small amts. first decreases the rotation especially for violet lines, giving abnormal dispersion, then if added in increased amts, causes a  $l$ -rotation with, however, normal dispersion. Malic acid shows the same type of phenomenon.

A. E. STEARN

**Graphitic acid—a colloidal oxide of carbon.** GEO. A. HULETT and O. A. NELSON. *Trans. Am. Electrochem. Soc.* 37, 425-39 preprint (1920).—Examn. of the literature on the prepn. of graphitic acid shows that its formation is promoted by  $\text{HNO}_3$ , which has the peculiar property of penetrating between the flakes of graphite. Polarized light shows that the flakes of graphitic acid are not cryst. but a colloidal substance of excessively thin plates and correspondingly large surface. An investigation was made of the moisture content of graphitic acid samples prepd. at the Bureau of Mines. Detn. of vapor pressures on removing successive amts. of  $\text{H}_2\text{O}$  gave curves without breaks

such as would occur when all extraneous  $H_2O$  disappeared. All the  $H_2O$  percentages suggested by various investigators were passed through, so that these formulas are concluded to have no significance. The relation of  $H_2O$  to graphitic acid is exactly that of moisture to a colloidal substance, and its variable properties are readily interpreted on the assumption that graphitic acid is a solid oxide of C, with the probable formula  $C_5O$  or  $C_{11}O_4$ .

F. H. HOTCHKISS

**Tetrachlorophenolphthalein.** E. T. WHITING. *J. Am. Chem. Soc.* **42**, 2366-8 (1920).—*Tetrachlorophenolphthalein*, m.  $215^\circ$ , is obtained in 45 g. yield from 50 g. pure phenolphthalein in 500 cc. pure AcOH slowly treated, with stirring, with 62 g. Cl in 975 cc. AcOH, allowed to stand overnight and concd. For its absorption spectrum, cf. Gibbs, Howe and Tyndall, *C. A.* **12**, 651. It is sol. in dil. alkalis (not in excess) with violet color, in excess without color, the salt of the carbinolcarboxylic acid sepg. in colorless needles on adding alc. and allowing to stand. A very slight excess of alkali suffices to decolorize the violet soln. in dil. alkalis and heating does not restore the color; alc. also decolorizes the violet soln. in dil. alkalis but heating restores the color which again disappears on cooling.  $Na_2CO_3$  (10%) also produces a violet soln. not completely decolorized by an excess of the  $Na_2CO_3$  and deepening in color when heated. Cold 10%  $NaHCO_3$  dissolves it only very slightly with faint violet color. It is sol. in excess of concd.  $NH_4OH$  with violet color and seps. in colorless crystals when the  $NH_3$  is boiled away. On shaking the violet soln. in  $Na_2CO_3$  several times with  $Et_2O$  the color disappears and the phthalein goes over completely into the ether; conversely, it can be extd. from  $Et_2O$  by shaking repeatedly with  $Na_2CO_3$ . It dissolves in concd.  $H_2SO_4$  with bright red color and is pptd. unchanged by  $H_2O$ . *Diacetate*, from the phthalein heated 1 hr. with  $Ac_2O$ , m.  $117^\circ$ , is insol. in alkali hydroxides and carbonates, sapond. by boiling alkalis, more rapidly in alc., dissolves in concd.  $H_2SO_4$  with bright red color.

CHAS. A. ROULLER

**Action of the Grignard reagent on thiocyanates.** ROGER ADAMS, H. B. BRAMLET and F. H. TENDICK. *J. Am. Chem. Soc.* **42**, 2369-74 (1920); cf. *C. A.* **11**, 338.—In the reaction between alkyl or aryl thiocyanates and Grignard reagents two main reactions take place:  $RSCN + RMgBr \longrightarrow RSR + MgBrCN$  and  $RSCN + RMgBr \longrightarrow RSMgBr + RCN \longrightarrow RSH$ . An excess (3 mols.) of the Grignard reagent was always used. With aliphatic thiocyanates both reactions occur; the yield of mercaptan is higher and that of thio ether lower when the thiocyanate is added to the Grignard reagent than when the latter is added to the thiocyanate. If, after the two substances have been mixed, the solid and the  $Et_2O$  soln. are worked up separately, the former yields chiefly the mercaptan, the latter the thio ether. With aromatic compds. the second of the above reactions takes place almost exclusively; the RCN produced in this reaction reacts with the excess of the Grignard reagent:  $RCN + RMgBr \longrightarrow RC(:NMgBr)R \longrightarrow RCOR$ . With aliphatic compds. the ketones formed are volatile and could not be sepd. from the large amt. of  $Et_2O$  used as solvent. The yields of mercaptan and thio ether are small when they are of low mol. wt. on account of their volatility. Thus, *iso*-AmSCN added to  $EtMgBr$  gave *iso*-AmSEt, b.  $158-61^\circ$ , and *iso*-AmSH, b.  $120-2^\circ$ ; if the  $EtMgBr$  is added to the *iso*-AmSCN it is more difficult to sep. the product; the yield of mercaptan is very small, and in addition to the main product, *iso*-AmSEt, some  $(iso-Am)_2S_2$  is formed. With  $PrMgBr$  are obtained *iso*-AmSH and *isoamyl propyl sulfide*, b.<sub>40</sub>  $179-81^\circ$ , d.<sub>20</sub> 0.851, n.<sub>D</sub><sup>20</sup> 1.4495. *iso*-BuSCN and  $EtMgBr$  gave small yields of the volatile *iso*-BuSH and *iso*-BuSEt. From  $C_7H_{15}SCN$  and  $EtMgBr$  were obtained  $C_7H_{15}SH$ , b.  $174-6^\circ$ , and *ethyl heptyl sulfide*, b.<sub>73</sub>  $188-92^\circ$ , d.<sub>20</sub> 0.871, n.<sub>D</sub><sup>20</sup> 1.4518. *iso*-AmSCN and  $PhMgBr$  gave, after treatment with HCl, much  $Ph_2C:NH.HCl$  and small amts. of *iso*-AmSH, *iso*-AmSPh and  $Ph_2CO$ .  $PhCH_2SCN$  and *iso*-BuMgBr yielded  $PhCH_2SH$ , b.  $194-5^\circ$ , and *benzyl isobutyl sulfide*, yellowish oil, b.  $243-4^\circ$ , d.<sub>10</sub>

0.968,  $n_D^{20}$  1.4912; with  $\text{PhMgBr}$  were obtained  $\text{Ph}_3\text{C}\cdot\text{NH}\cdot\text{HCl}$ ,  $\text{PhCH}_2\text{SH}$  and  $\text{Ph}_3\text{CO}$ ; with  $\text{EtMgBr}$ ,  $\text{PhCH}_2\text{SSEt}$ , b.  $218-20^\circ$ , and  $\text{PhCH}_2\text{SH}$ .  $\text{BzCN}$  (32.5 g.) and  $\text{PhMgBr}$  (78 g.  $\text{PhBr}$  and 12 g.  $\text{Mg}$ ) in 1 l.  $\text{Et}_2\text{O}$  gave  $\text{Ph}_3\text{COH}$ , m.  $159^\circ$ , and  $\text{Ph}_3\text{CH}$ , m.  $93^\circ$ ; if only 500 cc.  $\text{Et}_2\text{O}$  was used, the products were  $\text{PhBr}$ ,  $\text{Ph}_3\text{CH}$  and  $\text{BzOH}$ , while  $\text{BzCN}$  and  $\text{PhMgBr}$  in the proportion 1:1 yielded  $\text{Ph}_3\text{CO}$ ,  $\text{BzOH}$  and  $\text{Ph}_3\text{CCN}$  in poor yields and in the proportion 1:3  $\text{BzOH}$  and a small amt. of what was probably  $\text{PhC}_6\text{H}_5\text{CN}$ .  $(\text{CONPhMe})_2$ , m.  $110^\circ$ , was obtained in 95% yield from 4 parts com.  $\text{PhNHMe}$  in an equal vol. of  $\text{C}_6\text{H}_6$  slowly treated in ice under a reflux with 1 part  $(\text{COCl})_2$  in an equal vol. of  $\text{C}_6\text{H}_6$ , then allowed to evap. in an open dish and freed from  $\text{PhNHMe}\cdot\text{HCl}$  with cold  $\text{H}_2\text{O}$ ; 1 mole added in small portions to 4 moles  $\text{EtMgBr}$  in  $\text{Et}_2\text{O}$  gives 27 g.  $\alpha$ -ketobutyric methylanilide,  $\text{EtCONPhMe}$ , light yellow oil, b<sub>17</sub>  $165^\circ$ . Similarly, with  $\text{MeMgBr}$  was obtained pyruvic methylanilide, needles from petr. ether- $\text{Et}_2\text{O}$ , m.  $83-4^\circ$ , and with  $p\text{-MeC}_6\text{H}_4\text{MgBr}$   $p$ -toluylformic methylanilide, crystals from 85% alc., m.  $128-9^\circ$ .

CHAS. A. ROULLER

**Reactions of the arsines. Preliminary paper. Condensation of primary arsines with aldehydes.** ROGER ADAMS AND CHARLES SHATTUCK PALMER. *J. Am. Chem. Soc.* **42**, 2375-8(1920).—The present work was undertaken in order to det. whether org. As compds. equal or superior, therapeutically, to those which have already been found valuable (arseno and arsenic acid derivs.) might not be obtained which contained the As combined in a different way. A study of the condensation reactions of  $\text{PhAsH}_2$  with various org. substances has been begun, and such interesting results have been obtained that a number of investigations have been started to compare carefully the reactions of primary and sec. arsines and  $\text{AsH}_3$  itself with the corresponding N compds. Expts. have also shown that the phosphines and stibines react similarly. The present paper deals with the condensation of aldehydes with  $\text{PhAsH}_2$ . Addition products probably having the structure  $[\text{RCH}(\text{OH})]_2\text{AsR}$  are formed. When the aldehyde and arsine are treated with a few drops of  $\text{HCl}$  considerable heat is evolved and within a few min. the reaction is complete. The condensation must be carried out in  $\text{CO}_2$  or N to avoid oxidation of the arsine. The products are perfectly stable in cold  $\text{H}_2\text{O}$ , 10%  $\text{NaOH}$  and dil.  $\text{HCl}$  and even after boiling 5 min. no change takes place except to a small extent with  $\text{HCl}$ . The  $\text{PhAsO}_2\text{H}_2$  is obtained in 40-50% yields in 150-200 g. lots by a modification of Bart's reaction by the action of  $\text{PhN}_2\text{Cl}$  on  $\text{Na}_2\text{AsO}_3$  (Ger. pat. 254,092) and when reduced in 50 g. lots with amalgamated Zn dust and  $\text{HCl}$  gives 40-70% of  $\text{PhAsH}_2$ . *Di- $\alpha$ -hydroxybutylphenylarsine* (18 g. from 20 g.  $\text{PhAsH}_2$ , 5-6 drops concd.  $\text{HCl}$  and 20 g.  $\text{PrCHO}$ ), b<sub>28</sub>  $228^\circ$ ,  $d_{16}$  1.114,  $n_D^{20}$  1.686, is a slightly volatile oil, readily sol. in org. solvents but practically insol. in  $\text{H}_2\text{O}$ . *Di- $\alpha$ -hydroxybenzylphenylarsine*, similarly obtained from  $\text{BzH}$ , needles from  $\text{C}_6\text{H}_6$ , m.  $193^\circ$ .

CHAS. A. ROULLER

**The humin formed by the acid hydrolysis of proteins. VI. Effect of acid hydrolysis upon tryptophan.** GEORGE E. HOLM AND ROSS AIKEN GORTNER. *J. Am. Chem. Soc.* **42**, 2378-85(1920); cf. *C. A.* **14**, 1687.—From a study of the changes produced by boiling tryptophan (A) with 20%  $\text{HCl}$  for various lengths of time, H. and G. conclude that A is slowly altered and parts of the mol. are broken down by long acid hydrolysis; in the absence of aldehydes or other reactive compds., A contributes but an insignificant fraction of its N to the "acid-insol." humin, a much larger amt. appearing in the "sol. humin" after 144 hrs. boiling. Since, however, a normal protein hydrolysis rarely requires more than 24 hrs. boiling it appears extremely improbable that the "total humin" of such a hydrolyzate is derived from A without the intervention of some other reactive compd., postulated in earlier papers as being of the nature of an aldehyde. A is deaminized with relative ease by boiling 20%  $\text{HCl}$ ; probably some of the  $\text{NH}_2$  of a normal protein hydrolyzate is derived from A instead of entirely from amide groupings. When A has been boiled with 20%  $\text{HCl}$  the dis-



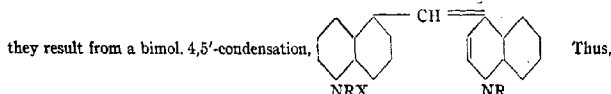
tribution of the N is such that errors may be introduced into both the "basic" and the "non-basic" N fractions of a Van Slyke detn. The method used in this investigation consisted in dissolving 0.500 g. A in 100 cc. of 20% HCl, detg. in aliquots the amino N by the Van Slyke method and the A colorimetrically with the Folin-Denis phenol reagent, boiling the A soln., taking aliquots at 12, 24, 36, 48, 96 and 144 hr. intervals, filtering, washing thoroughly, detg. the N in the residue by the Kjeldahl method, evapg. the filtrate to dryness *in vacuo*, detg. the "sol. humin" and "ammonia" in the usual way, acidifying the filtrate from these detns., concg. to about 35 cc., pptg. in the usual way with phosphotungstic acid, sepg. the "filtrates" and "bases" and making "amino" and "total" N detns. on each fraction. C. A. R.

**A sulfide acid or the butyl ether of thioglycolic acid.** YOSHISUKE UYEDA AND E. EMMETT REID. *J. Am. Chem. Soc.* **42**, 2385-9(1920).—*Butylthioglycolic acid*, obtained in 245 g. yield from 120 g. NaOH and 360 g. crude BuSH (75% pure) in 600 cc. H<sub>2</sub>O treated, with cooling and stirring, with a concd. soln. of 285 g. ClCH<sub>2</sub>CO<sub>2</sub>H previously neutralized with Na<sub>2</sub>CO<sub>3</sub>, heated after some hrs., steam-distd. to remove volatile impurities and pptd. with dil. H<sub>2</sub>SO<sub>4</sub>, is a slightly yellowish oil, *b*<sub>10-11</sub> 140-4°, *b*<sub>764</sub> 282.2° (slight decompn.), *d*<sub>4</sub><sup>25</sup> 1.0771, *d*<sub>25</sub><sup>25</sup> 1.0631, does not solidify at -14°, almost insol. in H<sub>2</sub>O but miscible with alc. and Et<sub>2</sub>O; the *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub> ester is an oil but the *p*-BrC<sub>6</sub>H<sub>4</sub>COCH<sub>2</sub> ester m. 95°. *Salts*: barium (0.5 H<sub>2</sub>O), flexible tablets; calcium (0.5 H<sub>2</sub>O), leaflets; strontium (1.5 H<sub>2</sub>O), tablets; nickel (2 H<sub>2</sub>O), faintly green crystals; cobalt (2 H<sub>2</sub>O); zinc (2 H<sub>2</sub>O), silky needles; cadmium (1 H<sub>2</sub>O); manganese (1 H<sub>2</sub>O), faintly pink flakes; copper (2 H<sub>2</sub>O), blue crystals; silver, gray crystals, m. 137.50°; ammonium, unstable cryst. mass; the Mg and Pb salts could not be obtained; the Na salt forms a sirupy very sol. mass. *Chloride* (155 g. from 150 g. of the acid and 70 g. PCl<sub>5</sub> heated 2 hrs. at 100°), *b*<sub>8-9</sub> 89-91°, *b*<sub>718</sub> 218° (considerable decompn.), *d*<sub>25</sub><sup>25</sup> 1.0956, *n*<sub>D</sub> 1.4810. *Amide*, m. 65°, is unstable in moist air. *Esters* (from the chloride and the alcs.): *methyl*, *b*<sub>10</sub> 85°, *b*<sub>718</sub> 224.0°, *d*<sub>4</sub><sup>0</sup> 1.0299, *d*<sub>25</sub><sup>25</sup> 1.0125, *n*<sub>D</sub><sup>25</sup> 1.4590; *ethyl*, *b*<sub>10</sub> 89-90°, *b*<sub>718</sub> 235.5°, *d*<sub>4</sub><sup>0</sup> 1.0044, *d*<sub>25</sub><sup>25</sup> 0.9881, *n*<sub>D</sub><sup>25</sup> 1.4560; *propyl*, *b*<sub>4</sub> 93-4°, *b*<sub>718</sub> 250.2°, *d*<sub>4</sub><sup>0</sup> 0.9892, *d*<sub>25</sub><sup>25</sup> 0.9723, *n*<sub>D</sub><sup>25</sup> 1.4555; *butyl*, *b*<sub>4</sub> 105-6°, *b*<sub>718</sub> 263.8°, *d*<sub>4</sub><sup>0</sup> 0.9794, *d*<sub>25</sub><sup>25</sup> 0.9630, *n*<sub>D</sub><sup>25</sup> 1.4555. CHAS. A. ROULLER

**Isocyanine dyes from lepidine and its homologs.** ELLIOT Q. ADAMS AND HERBERT L. HALLER. *J. Am. Chem. Soc.* **42**, 2389-91(1920).—The blue "cyanine" dyes are considered to be derivs. of 4,4-diquinolylmethane, *i. e.*, formed by condensation of a 4-H atom in one quinoline nucleus with the 4-Me group of another quinoline nucleus, and the pink "isocyanine" dyes as 4,2-derivs., formed by condensation of a 4-H atom with a 2-Me group, while the formation of pink dyes with alkalis and quinaldine alkyl halides alone is explained as a condensation of the 2-Me group in one mol. with the 4-H in the other. If this explanation is correct it should be possible to get similar dyes from lepidines by condensation of a 4-Me group with a 2-H atom. All the published accounts of dye formation from lepidine describe a blue or a violet color. This is probably due to the presence of quinoline in the lepidine used. When, however, sufficiently pure lepidine ethiodide is treated with hot concd. alc. alkali it yields an isocyanine, presumably isomeric with that from quinaldine ethiodide and having a similar photosensitizing action but crystallographically very different from it. Thus, 2.85 g. lepidine methiodide in 25 cc. boiling MeOH slowly treated with 10 cc. of 0.5 N NaOMe, boiled a few min. longer and allowed to cool very slowly yields 0.8 g. of an *isocyanine* in very fine bluish black crystals. Similarly 2.99 g. tolulepidine methiodide gives 0.75 g. *dye* as a cryst. felt with bluish green sheen; 3.13 g. tolulepidine ethiodide yields 0.47 g. of a *dye* as a purplish black powder with many crystals having a brassy and blue-green metallic reflection; lepidine ethiodide (1.5 g.) gives 0.16 g. of a *dye* sepg. in blunt (apparently) square prisms with brass-like luster and peculiar mottled

reflection; and tolulipidine methonitrate (from 4.50 g. of the methiodide) yields 0.43 g. of a dye in blue-black crystals. C. A. R.

**Kryptocyanines [cryptocyanines].** A new series of photosensitizing dyes. ELLIOT Q. ADAMS AND HERBERT L. HALLER. *J. Am. Chem. Soc.* **42**, 2861-3 (1920); cf. preceding abstr.—When the reaction between lepidine quaternary salts and alc. alkalis is carried out in very dil. soln., if the radical attached to the N is  $\text{Me}_2\text{CH}$  or if the reaction is carried out with the exclusion of air and the addition of  $\text{CHCl}_3$  or  $\text{HCHO}$ , there result dyes of a new type, with the absorption max. near 7000 Å. and max. photosensitizing action near 7400 Å. The dyes prepd. with the help of  $\text{CHCl}_3$  or  $\text{HCHO}$  are designated as "cryptocyanines." Their structure has not been detd. but it is suggested that



from 5.98 g. lepidine ethiodide in 100 cc. boiling alc. slowly treated with a fresh mixt. of 20 cc. of 0.5 N NaOEt and 1 cc. of 40%  $\text{HCHO}$  in the course of 20 min. and boiled 10 min. longer is obtained 0.43 g. *cryptocyanine K III* as a purplish black cryst. powder. Cryptocyanines have also been prepd. from tolulipidine meth- and ethiodides and methonitrate (with  $\text{HCHO}$ ) and from lepidine methiodide (with  $\text{CHCl}_3$ ); none was obtained in as good yield as *K III* and none equaled the latter in photosensitizing power.

CHAS. A. ROUITLER

**Synthesis of photosensitizing dyes. II. Dicyanine A.** LOUIS A. MIKESKA, HERBERT L. HALLER AND ELLIOT Q. ADAMS. *J. Am. Chem. Soc.* **42**, 2392-4 (1920).—The photosensitizing dye which, from the point both of prepn. and of use, has been found most satisfactory is that called by the German manufacturers "Dicyanin A." *2,4-Dimethyl-o-ethoxyquinoline*, crystals from petr. ether, b.  $314-6^\circ$ , is obtained in 75 g. yield from 300 g.  $\text{Me}_2\text{CO}$ , 200 g. paraldehyde and 300 g. *p*-phenetidine by a process which is described in detail. *Ethiodide* (10 g. from 10 g. each of the base and EtI heated 20 hrs. on the  $\text{H}_2\text{O}$  bath), crystals from 95% alc.; 5.36 g. of this with  $\text{AgNO}_3$  in alc. and subsequent treatment with NaOEt gives 0.15 g. *dicyanine A nitrate (A VI)* in grass-green crystals, while 10.72 g. of the ethiodide with NaOMe yields 0.25 g. of the beetle-green crystals of *dicyanine A iodide (A IV)*.

CHAS. A. ROUITLER

**Tetramethylquinolines.** LOUIS A. MIKESKA AND ELLIOT Q. ADAMS. *J. Am. Chem. Soc.* **42**, 2394-6 (1920).—As the dicyanine obtained from 2,4,6-trimethylquinoline seems to be somewhat superior to that obtained from 2,4-dimethylquinoline as a photosensitizing dye, a study of the effect of the introduction of another Me group into the  $\text{C}_6\text{H}_3$  ring was undertaken by substituting xylydines for  $\text{PhNH}_2$  in the syntheses. Three of the 6 tetramethylquinolines which can theoretically be used for these dicyanine syntheses have been prepd. from 27 g. of the appropriate xylylidine, 30 g.  $\text{Me}_2\text{CO}$  and 20 g. paraldehyde. The *2,4,6,8-tetramethylquinoline* (22-5 g.), from 2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{NH}_2$ , crystals from petr. ether, m.  $88^\circ$ , is identical with Levin and Riehm's product, which they thought was the 2,4,5,6- or 2,4,6,7-compd. (*Ber.* **19**, 1394 (1886)). *2,4,5,7-Derivative* (22-5 g.), from *sym*-xylylidine, crystals from petr. ether, m.  $59^\circ$ . *2,4,5,8-Compound*, from 2,5- $\text{Me}_2\text{C}_6\text{H}_3\text{NH}_2$ , m.  $131^\circ$ .

C. A. ROUITLER

**Preparation of lepidine and related bases.** LOUIS A. MIKESKA. *J. Am. Chem. Soc.* **42**, 2396-7 (1920).—A method is described whereby lepidine, b.  $262^\circ$ , can be obtained in 20 g. yield from 300 g.  $\text{Me}_2\text{CO}$ , 300 g. of 40%  $\text{HCHO}$  and 300 g.  $\text{PhNH}_2$ . In the same way are obtained *p*-tolulipidine and *p*-ethoxylepidine, crystals from petr. ether, m.  $77^\circ$ ; *ethiodide*, m.  $187^\circ$ .

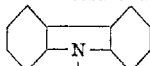
CHAS. A. ROUITLER

**Hypophosphorous acid preparation of arspenamine.** WALTER G. CHRISTIANSEN. *J. Am. Chem. Soc.* **42**, 2402-5 (1920).—Reduction of the 4,3- $\text{HO}(\text{H}_2\text{N})\text{C}_6\text{H}_4\text{AsO}_2\text{H}_2$  (A)

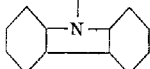
with  $\text{H}_2\text{PO}_2$  consistently gives an arspenamine (B) of low toxicity. By oxidizing toxic B to A and reducing this back to the B a product of low toxicity is obtained. The A was synthesized in 4 different ways and in every case the B obtained from it had a low toxicity. Instead of isolating the B as the free base after the reduction the reduced soln. was poured into HCl, thereby pptg. the di-HCl salt. The av. tolerated dose of 44 samples prepd. by  $\text{Na}_2\text{S}_2\text{O}_4$  reduction and the  $\text{MeOH-Et}_2\text{O}$  or the Kober method of converting the base into the HCl salt is 100 mg./kg. body wt. (ranging from below 60 to 140 mg.) while the average for 10 samples prepd. by C.'s method is 140 mg. (ranging from 120 to 160 mg.). The product so obtained is less readily sol. in  $\text{H}_2\text{O}$  than that prepd. by the  $\text{MeOH-Et}_2\text{O}$  method but the use of warm  $\text{H}_2\text{O}$  in dissolving it produces no harm.

CHAS. A. ROUILLER

**A bivalent nitrogen derivative of carbazole.** GERALD E. K. BRANCH AND JULIAN F. SMITH. *J. Am. Chem. Soc.* **42**, 2405-13(1920).—When 36.3 g.  $\text{Ag}_2\text{O}$  and 28.4 g. carbazole in 600 cc.  $\text{C}_6\text{H}_6$  and a little  $\text{C}_6\text{H}_5\text{N}$  are boiled 2 days under a reflux, protected from the air, there is obtained nearly quant. a mixt. of 2 substances, one of which has not yet been investigated and the other of which (A) appears to be a di- or tricar-



bazyl deriv. of the substance



. A is an almost white powder forming

red-brown solns. with blue fluorescence, m.  $283-7^\circ$  (decompn.), very sol. in  $\text{C}_6\text{H}_6$  or  $\text{C}_6\text{H}_5$  derivs.,  $\text{CHCl}_3$ ,  $\text{CHBr}_3$ ,  $(\text{CH}_2\text{Br})_2$ ,  $\text{CS}_2$ , thiophene and  $\text{C}_6\text{H}_5\text{N}$ , slightly in  $\text{CCl}_4$  and  $\text{AcOEt}$ , insol. in ligroin,  $\text{Et}_2\text{O}$ , alc.,  $\text{AcOH}$  and  $\text{H}_2\text{O}$ . On evapn. its solns. leave a brown vitreous mass from which the A can be obtained as a white powder on treatment with alc. This vitreous mass retains the solvent. The color is approx. the same in all solvents but the fluorescence varies considerably; the satd.  $\text{CCl}_4$  soln., though markedly colored, does not fluoresce; in  $\text{PhNO}_2$  the fluorescence is green instead of blue. The mol. wt. in freezing  $\text{C}_6\text{H}_6$  varies with the concn. from 472 for 0.1192 g. in 26.31 g.  $\text{C}_6\text{H}_6$  to 544.5 for 0.351 g. in 26.31 g. A adds NO in boiling  $\text{C}_6\text{H}_6$ , forming a yellow cryst. ppt. sol. in  $\text{C}_6\text{H}_5\text{N}$  and m. above  $270^\circ$ ; with dry HCl in  $\text{C}_6\text{H}_6$  at room temp. it gives a yellowish ppt. sol. in  $\text{C}_6\text{H}_5\text{N}$ , having a high m. p. and free from Cl. It is sol. in concd.  $\text{H}_2\text{SO}_4$  with deep green color and on diln. gives a green ppt. which when shaken with alkali forms a discolored powder insol. in  $\text{C}_6\text{H}_6$  but sol. in  $\text{C}_6\text{H}_5\text{N}$ . With O in xylene it forms only a trace of ppt. It does not decolorize I in  $\text{C}_6\text{H}_6$ ; with Br it reacts vigorously and some HBr is evolved, with some pptn. but the major portion of the product remains in soln. and on evapn. leaves a brown residue forming a white powder on heating and giving a strong halogen flame test; it chars before melting and dissolves in  $\text{C}_6\text{H}_6$  with a yellow-brown color but no fluorescence. The high dissociation (into odd mols. in which the N is probably bivalent) indicated by the f. p. method could not be confirmed colorimetrically.

CHAS. A. ROUILLER

**Preparation of certain derivatives of cyclohexane.** A. E. OSTERBERG AND E. C. KENDALL. *J. Am. Chem. Soc.* **42**, 2616-26(1920).—Cyclohexane (A), b.  $80-50^\circ$ , is obtained in 275 g. yield from 300 g.  $\text{C}_6\text{H}_5$  (free from thiophene) and 30 g. Ni (prepd. by calcining the nitrate at dull red heat for 1 hr. and reducing in H at  $250^\circ$  for several hrs.) heated 48 hrs. at  $250^\circ$  in H under 1800 lbs. pressure, more H being introduced at 2 hr. intervals during the day. Cyclohexanol (B),  $b_{730} 158^\circ$ , is similarly obtained in 255 g. yield from 300 g.  $\text{PhOH}$ . From 100 g. B in 150 cc.  $\text{H}_2\text{O}$  and 35 cc. concd.  $\text{H}_2\text{SO}_4$  treated in the course of 2 hrs. with 100 g.  $\text{Na}_4\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$  in 35 cc. concd.  $\text{H}_2\text{SO}_4$  and 150 cc.  $\text{H}_2\text{O}$  in 10 cc. portions and heated 2 hrs. on the  $\text{H}_2\text{O}$  bath is obtained 83 g.

cyclohexanone (C), b. 155°. *o*-Chlorocyclohexanone (D), from C and  $\text{CaCO}_3$  in  $\text{H}_2\text{O}$  treated with Cl, cannot be distd. *in vacuo* without decompn. and is difficult to obtain free from Cl. The oxime of C, m. 88°, can be obtained quant. from 8.4 g.  $\text{NH}_4\text{OH} \cdot \text{H}_2\text{SO}_4$  in 60 cc.  $\text{H}_2\text{O}$  added slowly to 10 g. C in 50 cc.  $\text{H}_2\text{O}$  with 4.1 g. NaOH or an excess of  $\text{NaHCO}_3$ . Cyclohexylamine is obtained in good yield by reduction of the oxime by Baeyer's (Na and alc.) or Sabatier and Senderens' method (Amouroux. *C. A.* 6, 2405). Senderens' catalytic  $\text{H}_2\text{SO}_4$  method for the prepn. of cyclohexene (*C. A.* 6, 1749) is easy of application and gives practically quant. yields.  $\text{PCl}_5$  has also been found to be fairly efficient for the dehydration of B. *o*-Chlorocyclohexanol (E), obtained in 85 g. yield from 100 cc. cyclohexene shaken with 1700–1800 cc. of 2%  $\text{HOCl}$  in 200 cc. portions, satd. with NaCl and distd. with steam, is  $\text{H}_2\text{O}$ -white, b. 92° and under atm. pressure with only slight decompn. *o*-Aminocyclohexanol (F), (70 g. from five portions of 26.8 g. E in 100 cc. of concd.  $\text{NH}_4\text{OH}$  in 50% alc. heated 1 hr. on the  $\text{H}_2\text{O}$  bath), b. 104°, b. 212°, m. 65°; hydrochloride, m. 175°; hydriodide, m. 187°; hydrobromide, m. 191°; carbonate, m. 139°; sulfate, does not m. 250°. *o*-Chlorocyclohexylamine, obtained in 70–80% yield, if  $\text{H}_2\text{O}$  is carefully excluded, from F.HCl and  $\text{PCl}_5$  in  $\text{CHCl}_3$  at 0°, is an oil with a characteristic odor, b. 85°, does not solidify at  $-10^\circ$ , gives quant. with 1.5 times the calcd. amt. of  $\text{AcCl}$  refluxed about 2 hrs. the acetyl derivative, crystals from  $\text{EtOH} \cdot \text{H}_2\text{O}$ , m. 88°; chloroacetyl derivative, m. 111°, sol. in 220 parts hot and 2000 parts cold  $\text{H}_2\text{O}$ ; 4 g. of this boiled 10 min. with 4 g. NaCN in 400 cc.  $\text{H}_2\text{O}$  gives 2.3 g. cyanoacetyl-*o*-chlorocyclohexylamine, m. 139°, 4 g. of which, refluxed 1 hr. in 75 cc. alc. in a current of HCl, concd. to 0.5 its vol., filtered from the  $\text{NH}_4\text{Cl}$  and sapond. with NaOH, yields malonic mono-*o*-chlorocyclohexylamide, m. 132°. *o*-Bromocyclohexylamine hydrochloride, prepd. like the Cl compd. (75 g. from 57.5 g. F and  $\text{PBr}_3$  in  $\text{CHCl}_3$  below 35–40°), needles from PhMe, m. 168°; acetyl derivative, obtained in 61% yield from the above compd. refluxed several hrs. in PhMe with  $\text{AcCl}$ , m. 103–4°.

CHAS. A. ROUILLER

**Oxidation of the Grignard reagent.** C. W. PORTER AND CAROLYN STEEL. *J. Am. Chem. Soc.* 42, 2650–4 (1920).—This work was undertaken to det. the influence of temp. upon the yield of phenol and the yields of the principal by-products and to secure evidence concerning the mechanism of the reduction whereby Grignard reagents are oxidized to phenols (Wuyts, *C. A.* 3, 2145). O was passed 5 hrs. through solns. of  $\text{PhMgBr}$  in  $\text{Et}_2\text{O}$  at 0°, 7–9°, 20° and 32°. The yield of  $\text{Ph}_2$  was practically const. (about 10%) at all temps. and just as high in solns. which had not been oxidized at all, while the av. yield of  $\text{PhOH}$  was 22.9, 19.8, 19.1 and 16.8%, resp., at the 4 temps.; in solns. as ordinarily prepd. (protected from the atm. O only by the  $\text{Et}_2\text{O}$  vapor in the reflux) the amt. of  $\text{PhOH}$  was about 3%. When evapd. or distd. with steam, the  $\text{Et}_2\text{O}$  ext. of the hydrolyzed product gives a tar (0.1–0.4 of the wt. of the Ph groups in the reagent) from which were isolated *p*- $\text{C}_6\text{H}_4\text{Ph}$ , quinone and (*p*- $\text{HO}(\text{C}_6\text{H}_4)_2$ ). P. and S. assume that the formation of these compds. may be represented as follows:  $\text{PhMgBr} + \text{O}_2 \longrightarrow \text{PhOOMgBr}$ ;  $\text{PhOOMgBr} + \text{PhMgBr} \longrightarrow 2\text{PhOMgBr}$ ;  $\text{PhOMgBr} + \text{H}_2\text{O} \longrightarrow \text{PhOH} + \text{MgBrOH}$ ;  $\text{PhOOMgBr} + \text{PhOMgBr} \longrightarrow \text{PhOOPh} + \text{O}(\text{MgBr})_2$ ;  $\text{PhOOPh} \longrightarrow \text{HO}(\text{C}_6\text{H}_4)_2\text{OH}$ ;  $\text{PhOOPh} \longrightarrow \text{PhOPh} + \text{O}$ , the atomic O liberated according to the last equation oxidizing the peroxide to quinone. If the product is hydrolyzed in the presence of Zn and HCl, somewhat more  $\text{PhOH}$  is formed (24.7%).

C. A. ROUILLER

**Methylamines from methanol and ammonium chloride.** W. D. TURNER AND A. M. HOWALD. *J. Am. Chem. Soc.* 42, 2663–5 (1920).—The purpose of this work was to det. the best conditions of time, temp., proportion of reagents, etc., for the methylation of  $\text{NH}_3$  by heating with MeOH and a dehydrating agent under pressure (Mertz and Gaskioroski, *Ber.* 17, 640 (1884)). It was found that methylamines are formed only in traces when  $\text{NH}_3$  or  $\text{NH}_4\text{Cl}$  and MeOH are heated alone as high as

303°. With  $\text{ZnCl}_2$  good yields of mono- and dimethylamine can be obtained; thus, after 8 hrs. at 303° were obtained 55, 7.5 and 1.86% mono-, di- and trimethylamine from  $\text{NH}_4\text{Cl}$ . The yields increase with the amt. of  $\text{ZnCl}_2$ , with the temp., with the length of heating and with increase in the ratio of  $\text{MeOH}$  to  $\text{NH}_3$ . The heating was done in bombs made of steel pipe; where  $\text{ZnCl}_2$  was used, the  $\text{HCl}$  formed by its hydrolysis attacked the bomb and no expts. could be carried to equil. CHAS. A. ROULLER

**The decomposition of nitric acid in organic nitrations.** F. O. RICE. *J. Am. Chem. Soc.* 42, 2665-70 (1920).—When metals dissolve in  $\text{HNO}_3$   $\text{N}_2\text{O}$  is produced as well as higher oxides of N, the metal salt sometimes acting as catalyst in the production of  $\text{N}_2\text{O}$ . This reduction may also occur in org. nitrations. The fumes given off from the nitration vessel in the manuf. of picric acid (the rate of their evolution being measured by a gas flow-meter) were cooled to condense any  $\text{HNO}_3$  vapor and samples of the gas drawn off at intervals of a few min. and analyzed. The compn. of the gas followed, approx., the stages at which the three  $\text{NO}_2$  groups are introduced. The mean of a large number of detns. gave the following values for the 3 stages, resp.:  $\text{NO}_2$  5.0, 10.0, 21.0;  $\text{NO}$  10, 25, 28;  $\text{N}_2\text{O}$  20, 10, 4; N 10, 10, 8; CO 10, 8, 4;  $\text{CO}_2$  45, 37, 35%. The greatest decompn. of the  $\text{HNO}_3$  therefore occurs during the first stage of the nitration, for not only is the % of  $\text{N}_2\text{O}$  and N highest but the rate of evolution of gas is also greatest during this stage. When the nitration was completed, the product was also analyzed. As the mean of 10 expts., some on a technical scale with a 12 kg. charge of  $\text{PhOH}$ , others on a small lab. scale, the following results were obtained, calcd. on the basis of a charge of 100 g.  $\text{PhOH}$ , 260 g.  $\text{HNO}_3$  and 427 g.  $\text{H}_2\text{SO}_4$ .  $\text{HNO}_3$ : distd. unchanged 7.2; evolved as  $\text{NO}_2$  9.3; as  $\text{NO}$  17.3; as  $\text{N}_2\text{O}$  36.0; as N 21.7; contained in the picric acid produced 160.6; free in the weak  $\text{H}_2\text{SO}_4$  4.6; total 256.7 g.  $\text{PhOH}$ : nitrated to picric acid 79.2; oxidized to  $(\text{CO}_2\text{H})_2$  5.2; to CO 2.4; to  $\text{CO}_2$  8.1; total 94.9 g.  $\text{H}_2\text{SO}_4$  in weak acid 422.0 g. Temp. is the main factor in the reduction to  $\text{N}_2\text{O}$  and N; if it is kept well below 100° during the early stages and then slowly raised to 100° until the nitration is complete the  $\text{N}_2\text{O}$  and N amt. to less than 1% of the  $\text{HNO}_3$ ; the latter is decompd. to about the same extent but in this case chiefly to  $\text{NO}$ . It was not found possible to prevent some decompn. of the  $\text{PhOH}$  (20% in the best expts.). Fe salts accelerate the reduction. By sulfonating  $\text{PhOH}$  almost to the disulfonate stage with 96%  $\text{H}_2\text{SO}_4$  and then nitrating at a low temp. (30-40°) with  $\text{H}_2\text{SO}_4$ - $\text{HNO}_3$ , only  $\text{NO}_2$  and  $\text{NO}$  are evolved and slightly more than 90% picric acid is obtained. Under the best conditions so far found, almost 10% of the  $\text{PhOH}$  is oxidized with consequent reduction of the  $\text{HNO}_3$  to oxides of N. C. A. ROULLER

**Dimethylpropylcarbinol and some of its derivatives.** ANDRÉ DESCHAMPS. *J. Am. Chem. Soc.* 42, 2670-2 (1920).— $\text{Me}_2\text{CPrOH}$  was prepd. from  $\text{PrMgI}$  and  $\text{Me}_2\text{CO}$  (so obtained it was always contaminated with I compds.) or, in 50% yields and free from halogens, from  $\text{PrMgBr}$  and  $\text{Me}_2\text{CO}$ ; it is a slightly viscous liquid almost insol. in  $\text{H}_2\text{O}$ , with an odor suggestive of freshly peeled bark,  $b_{762}$  122.5-3.5°,  $d_{4.4}^{15.5}$  0.8350,  $n_{D-15.5}^{15.5}$  1.4125, m. -107° to -109°. Boiled 0.5 hr. with 4 mols.  $\text{HBr}$  (d. 1.45) it gives the bromide, does not freeze -18°,  $n_D^{25}$  1.442,  $d_4^{25}$  1.117. Chloride, obtained with 4 mols.  $\text{HCl}$  (d. 1.20),  $b_{41}$  50-3°. *Phenylurethan*, from the carbinol boiled a few min. with 1 mol.  $\text{PhNCO}$ , long needles from alc. and  $\text{Me}_2\text{CO}$ , m. 239°. *Benzoate*, from  $\text{BzCl}$  in  $\text{C}_6\text{H}_5\text{N}$ , needles from alc., m. 182-3°. CHAS. A. ROULLER

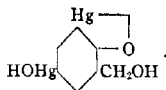
**The individuality of erythroderitrin.** J. C. BLAKE. *J. Am. Chem. Soc.* 42, 2673-8 (1920); cf. C. A. 12, 928.—It has previously been shown that if the dextrin used for the prepn. of erythroderitrin (A) contains much of the blue-producing amyloderitrin (B) low concns. of alc. will remove the latter completely but probably 0.5 of the A is lost in the ppt. In dextrin solns. from which fragments of the cell walls have been filtered off this ppt. assumes the form of spherocrystals in which the A seems to be present in solid soln. It was thought for a time that after all the B had been removed from

approx. 20% solns. in this way all of the higher polysaccharides had also been removed, but it was often observed that further addition of alc., instead of giving the heavy liquid in which form A subsequently ppts., continued to yield small crops of spherocrystals, indicating that part of the higher polysaccharides was still present. This was confirmed by examn. of the "A" pptd. by slight further addition of alc.; the heavy liquids thus pptd. from the same concn. of different dextrans by the same % of alc. had widely varying powers of turning red with I and many of them became turbid on standing and became largely insol. in cold  $H_2O$ . Four such heavy liquids were accordingly dried over  $CaCl_2$  and powdered and solns. of these powders were polarized and their power of coloring red with I, their digestibility to the achromatic point with fresh saliva and their power of reducing Benedict's quant. reagent were detd. The results, at their face value, would seem to indicate that the products contained about 2% of sugar. As, however, the original raw dextrans gave only a faint test with Benedict's qual. reagent and the method of sepg. the heavy liquids from which the powders were obtained precluded the presence of sugar, it seems that the uniform Cu reduction measures the amt. of decompn. of A during the heating necessary to make the test. Assuming that the depth of the red color given with I water measures the amt. of A present and that the time required for digestion to the achromatic point measures the same quantity, the ratio of these 2 detns. ought to be const.; the values of these ratios found for the 4 samples were 3.00, 1.97, 1.72 and 1.92, resp. The results indicate plainly that the 1st sample was far richer in A than any of the others. When 450 cc. of a heavy liquid resembling the last 3 samples was treated with 197 g.  $(NH_4)_2SO_4$  two layers resulted, the heavier (177 cc.) containing almost all the A while the lighter layer contained considerable org. matter precipitable, along with  $(NH_4)_2SO_4$ , by further addition of alc. The lower layer, freed from  $(NH_4)_2SO_4$  by heating 2 hrs. with excess of  $BaCO_3$ , yielded with 42% alc. the A as a heavy liquid which, when dried and tested as above, showed that the last traces of B had been removed and that the ratio of the red color with I to the time required for digestion to the achromatic point was the same as that for the first of the above samples but that the red color and the time required for digestion were only 75% as great, i. e., that there was only 75% as much A; this loss must be attributed to a partial conversion to achroodextrin during the heating with  $BaCO_3$ .

CHAS. A. ROUVIER

**Mercury compounds of some phenylcarbinols.** MERRILL C. HART AND ARTHUR D. HIRSCHFELDER. *J. Am. Chem. Soc.* 42, 2678-86 (1920).—In view of the local anesthetic and antispasmodic properties of the phenylcarbinols and their esters it seemed possible that Hg derivs. of this group might prove useful as antiseptics and might perhaps also possess valuable chemotherapeutic properties. The compds. of saligenin (A) and 4,3- $HO(O_2N)C_6H_3CH_2OH$  (B) described below have been found to be about as efficient antiseptics as  $HgCl_2$  but much less irritant to the tissues and are being used successfully in the treatment of gonorrheal urethritis. Their pharmacological properties will be published elsewhere. The A, flakes from PhMe, m.  $86^\circ$ , was prepd. by Hutchinson's method (*Ber.* 24, 173 (1891)); 15 g. in 250 cc. of 95% alc. heated under a reflux 30 min. with 80 g.  $Hg(OAc)_2$  in 150 cc.  $H_2O$  and 5 cc. AcOH and allowed to stand overnight gave 75 g. of a compound (C)  $C_{12}H_9O_4Hg \cdot 3.5H_2O$  (also obtained from the components allowed to stand several weeks at room temp.), sol. in hot AcOH with sepn. of  $HgOAc$  on cooling, sol. in hot  $Ac_2O$  and the alkali hydroxides, insol. in  $NH_4OH$ , unattacked in  $H_2O$  suspension by  $H_2S$ , gradually gives (in the course of several hrs.)  $HgS$  with  $H_2S$  in alkalies, begins to turn brown  $160^\circ$ , evolves gas  $169^\circ$ . The chloride is extremely little sol., the bromide and iodide somewhat more; the sulfate is insol., the nitrate sol. The Na salt, from a concd. soln. of C in 10% NaOH slowly poured into 95% alc., is a yellow granular solid extremely sol., when fresh, in  $H_2O$  with slightly yellow color but slowly taking up  $CO_2$  in the air and be-

coming more or less difficultly sol. C is assigned the structure



*Acetate*,  $\text{HO}(\text{AcOHg})_2\text{C}_6\text{H}_2\text{CH}_2\text{OAc}$ , from **B** (60 g.) dissolved in hot  $\text{Ac}_2\text{O}$  and filtered rapidly, seps. in rod-shaped flat-sided crystals with 1  $\text{H}_2\text{O}$  (19 g.). No mono-Hg deriv. of **A** could be isolated. *p*-Hydroxy-*m*-nitrophenylcarbinol (**B**), from  $o\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$  and a slight excess of  $\text{BrCH}_2\text{OH}$  allowed to stand several days with a little fused  $\text{ZnCl}_2$ , long yellow needles from  $\text{H}_2\text{O}$ , m.  $97^\circ$ ; 25 g. in 500 cc. alc. with 94 g.  $\text{Hg}(\text{OAc})_2$  in 200 cc.  $\text{H}_2\text{O}$  and 15 g.  $\text{AcOH}$  refluxed 6 hrs. and allowed to stand some time gives 29 g. of the compound 4,3,6- $\text{HO}(\text{O}_2\text{N})(\text{HOHg})\text{C}_6\text{H}_2\text{CH}_2\text{OH}$ , long light yellow needles from 20%  $\text{AcOH}$ , sol. in alkalis with deep reddish yellow color, does not m.  $240^\circ$ , forms salts with properties like those of the salts of **B**. *Acetate*,  $\text{HO}(\text{O}_2\text{N})(\text{AcOHg})\text{C}_6\text{H}_2\text{CH}_2\text{OH}$ , light yellow needles. The affinity of **A** for Hg is so great that when 15 g. of it is refluxed for 2 hrs. with 80 g.  $\text{Hg}(\text{OAc})_2$  and allowed to stand for 2 hrs.  $\text{H}_2\text{S}$  produces no ppt. in the mixt. The aromatic alcs. which do not contain a phenolic HO group ( $\text{PhCH}_2\text{OH}$ ,  $\text{PhCH}_2\text{CH}_2\text{OH}$ , *p*- $\text{Me}_2\text{CHC}_6\text{H}_4\text{CH}_2\text{OH}$  and 2,5- $\text{HO}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{CH}_2\text{OH}$  do not react with  $\text{Hg}(\text{OAc})_2$ .

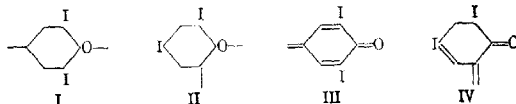
C. A. R.

**Preparation of rhamnose.** C. F. WALTON, JR. *J. Am. Chem. Soc.* **43**, 127-31 (1921).—A com. prepn. of quercitrin, "Lemon Flavin," costing 90 cents a lb., has been found so rich in quercitrin, the ordinary source of rhamnose, that the latter is now one of the easiest and cheapest sugars to make: 600 g. of the flavin are boiled 30 min. with 6 l. tap  $\text{H}_2\text{O}$  and 20 cc.  $\text{H}_2\text{SO}_4$  (d. 1.84), cooled, filtered with suction, washed with boiling  $\text{H}_2\text{O}$ , neutralized to litmus by boiling with  $\text{BaCO}_3$ , filtered, decolorized with active charcoal, concd. *in vacuo* to a density of about 40% solids, treated with 3 vols. warm abs. alc., filtered, concd. *in vacuo* to a thin sirup (70-80% solids) and allowed to cryst., a few cc.  $\text{AcOH}$  being added to prevent lump formation. Yield, 20-5% of the flavin.

C. A. R.

A catalytic decomposition of certain phenol silver salts. III. Action of mercury on tribromophenol bromide. W. H. HUNTER AND G. H. WOOLLEY. *J. Am. Chem. Soc.* **43**, 131-5 (1921); cf. *C. A.* **12**, 279.—The removal of 2 atoms of Br from tribromophenol bromide (**A**) produces the same effect as the removal of a Ag and a Br atom from either of the Ag salts of **A**, viz., the formation of residues which polymerize to a compd. of high mol. wt.,  $(\text{C}_6\text{H}_2\text{OBr}_2)_n$  (**B**). Thus, 3 g. **A** shaken 45 min. with 2 cc. Hg in 25 cc.  $\text{C}_6\text{H}_6$  gave 0.5 g. **B**. Benedikt's "hexabromodiphenoquinone" (**C**) (*Ann.* **199**, 128 (1879)), prepd. by heating **A** at  $130\text{--}40^\circ$  in  $\text{CO}_2$ , resembles **B** in most of its properties but is readily distinguished from **B** by its ready soly. in  $\text{Et}_2\text{O}$ . The product obtained by Kastle and Loevenhart by the action of sunlight on **A** in  $\text{CS}_2$  (*Am. Chem. J.* **27**, 21 (1902)) is identical with **B** and is not the true tetrabromodiphenoquinone (**C**), as they tentatively suggest. A series of expts. on the action of **A** in  $\text{CHCl}_3$  on the red Ag salt of  $\text{Br}_3\text{C}_6\text{H}_2\text{OH}$  showed conclusively that K. and L.'s interpretation of the reaction is incorrect; the Ag salt is catalytically decompd. by the small amt. of Br resulting from the decompn. of the **A** into AgBr and the expected dibromo oxide; the **A** is left largely unchanged, a small amt. changing to a tar and another small part probably giving **C**. Thus, 2.05 g. **A** in 100 cc.  $\text{CHCl}_3$  allowed to stand with 2.19 g. of the Ag salt until the reaction was complete, filtered from the AgBr, concd. to  $\frac{1}{2}$  its vol., treated with alc. to complete pptn., filtered, boiled to reduce the **A** to  $\text{Br}_2\text{C}_6\text{H}_2\text{OH}$ , concd., filtered and treated with  $\text{H}_2\text{O}$ , gave 0.955 g. AgBr, 1.252 g. **B**, 1.25 g.  $\text{Br}_2\text{C}_6\text{H}_2\text{OH}$  and 0.15 g. tar. IV. Constitution of the amorphous oxides. *Ibid.* 135-51.—As shown in previous papers, the Ag salts of *sym*-trihalophenols can be smoothly decompd. by the catalytic action of undild.  $\text{EtI}$  or small amts. of **I** into Ag halides and amorphous substances of high mol. wt. The halogen may be removed from

either the *o*- or the *p*-position to the HO group and it was assumed that the amorphous compds. were polydihalophenylene oxides (A), formed by ether-like combinations of the resulting residues (I and II). Later it was found, however, that from the Ag salt of  $I_3C_6H_2OH$  two isomeric compds. can be obtained, one colorless and the other deeply reddish purple (C. A. 11, 49). Lautemann, by the action of boiling alkali and I on salicylic acid, obtained a reddish purple substance (B) entirely analogous in compn. to H. and H.'s compds. (*Ann.* 120, 309(1861)) and Kammerer and Benzinger prepd. the same substance from alkali, I and PhOH. H. and W. repeated their work and also treated the pure K salt of  $I_3C_6H_2OH$  with I and in all cases obtained deep pink to reddish purple products of the compn.  $(C_6H_2OI_2)_n$ , with mol. wts. of 2300–3100 in  $CHBr_3$ , 4800–5100 in  $(CH_2Br)_2$ , and containing 0.36–0.95% quinoid O as detd. by measuring the amt. of N liberated from alk.  $N_2H_4$ . It seemed possible that B might be a mixt. of the colorless A with some of the true dinuclear quinone, tetraiododiphenylene quinone (D), but all attempts to isolate D from the mixt. failed. With mixts. in the most varied proportions of the Br analog of B with C, no difficulty was experienced in sepg. the 2 components. B was put through the following series of reactions: Reduction by  $N_2H_4$ , acetylation with  $Ac_2O-FeCl_3$ , hydrolysis with alc. KOH, oxidation in  $CS_2$  with  $PbO_2$ ; I, quinoid O and mol. wt. detns. were made at every stage and cryst. compds. were carefully sought for but none were found. The results indicate clearly that there is no D in the mixt., that part of the O in B is reduced by  $N_2H_4$  to HO groups which can be acetylated; that these Ac groups can be sapond. and the HO groups reappear; the HO compds. can be oxidized back to the original B. Since the amt. of O which can be thus reduced is small most of it must be present in ether combination as in the colorless A, and as the mol. wt., color and amt. of quinoid O vary in different samples of B, it is concluded that the colored substances are polymerization products containing the residues I and II, together with some residues III, and possible IV. This view is further strengthened by comparison



of the absorption spectra of compds. of the type of A, B and C. To distinguish those of type B from those of type A the former are designated *chromopolydihalophenylene oxides*. *Potassium triiodophenol*, from 15 g.  $I_3C_6H_2OH$  in 125 cc.  $C_6H_6$  and 2 g. KOH in 1 cc.  $H_2O$  and 50 cc. abs. alc. freed from the solvents by distn., seps. from alc. in grayish yellow crystals with 1 EtOH, becomes full yellow on slight warming alone or in  $C_6H_6$ , decomp. at  $75^\circ$  in the air; 0.2191 g. in 5 cc.  $H_2O$  with 2 drops of 0.025 N Br gives 0.1807 g. of B; the same change is effected by sunlight. *Potassium tribromophenol* decomp. at the temp. of boiling  $C_6H_6$  into KBr and A but by working under 3–4 cm. pressure the highest temp. reached is about  $35^\circ$  and the salt comes down as a white ppt. sepg. from alc. and  $C_6H_6$  in needles yielding, when wet with  $H_2O$  and exposed to Br vapors, the *bromine analog* of B. B is prepd. in quantity by slowly adding to 10 g. PhOH and 111 g.  $Na_2CO_3$  in 1 l. boiling  $H_2O$  a soln. of 100 g. I and 75 g. KI and destroying the excess of I with  $Na_2S_2O_3$ ; it is a deep purple powder unacted on by acids, alkalis or the ordinary oxidizing agents, reduced to a colorless powder by Sn and concd. HCl and by  $N_2H_4$  in concd. alkali. V. Action of iodine on the sodium salt of trichlorophenol. W. H. HUNTER and LILLIAN M. SEYFRIED. *Ibid* 151–9.—When  $Cl_3C_6H_2ONa$  (A) in  $Me_2CO$  is heated for equal lengths of time with 0.1, 0.2 and 1 atom of I, 2, 21 and 71% yields of polydichlorophenylene oxide (B) (identical with the product of the thermal decompn. of the Ag salt) are obtained; by



longer action of 0.4 atom of I, more than 65% of the salt is converted into the oxide and free I is still present. The final yield of oxide is therefore detd. not by the amt. of I but by the length of contact, and the I acts either by its presence only or is regenerated as fast as it is converted into NaI. Quant. detns. of the reaction products (in H<sub>2</sub>O with I-KI and in C<sub>6</sub>H<sub>6</sub> with free I) showed that the A which is not converted into B remains unchanged; the I appears at the end in the free state because the Cl combines with the Na; the Cl which leaves the ring is converted into chlorine, completely in H<sub>2</sub>O, incompletely in C<sub>6</sub>H<sub>6</sub>; in the latter 15% of the lost Cl does not appear as chloride and some apparently is substituted in the B (the product contained 44.97% Cl; calcd. for pure B 44.07); also 11% of the I appears as NaI. Every point in the action of the I seems cleared up except the means by which the Cl atom leaves the ring; the reaction may be most simply expressed by the following equations:  $2\text{Cl}_3\text{C}_6\text{H}_2\text{ONa} + \text{I}_2 = 2\text{NaI} + \text{Cl}_3\text{C}_6\text{H}_2\text{O} -$ ;  $2\text{Cl}_3\text{C}_6\text{H}_2\text{O} - = \text{Cl}_2 + 2 - \text{Cl}_3\text{C}_6\text{H}_2\text{O} -$ ;  $n(-\text{Cl}_3\text{C}_6\text{H}_2\text{O}-) = (\text{C}_6\text{H}_2\text{OCl}_3)_n$ ;  $2\text{NaI} + \text{Cl}_2 = 2\text{NaCl} + \text{I}_2$ . C. A. ROUILLER

**Lobinol**—a dermatitant from *Rhus diversiloba* (poison oak). JAMES B. MCNAIR. *J. Am. Chem. Soc.* 43, 159-64(1921); cf. C. A. 10, 2225.—Attempts to sep. the principal irritant poison (lobinol) of *Rhus diversiloba* are described in the hope that someone will continue the work and det. the structure of the poison. A substance which cannot positively be stated to be a definite chem. individual but is apparently at least a mixt. of appreciably uniform compn. relatively free from contamination is obtained by heating the bark from old branches several days in 95% alc. under a reflux, concg. the soln. to 0.1 its vol., shaking with 3 vols. H<sub>2</sub>O and petr. ether, shaking the petr. ether layer several times with 95% alc., adding satd. NaCl to the alc. ext. and washing with H<sub>2</sub>O the resultant clear, amber-red, non-volatile, viscous, poisonous liquid. The principal dermatitant, lobinol, of the poison oak appears to be a polyhydric phenol and shows the following provisional properties: It absorbs Br readily, becomes temporarily green in alc. with FeCl<sub>3</sub>, then black and forms a black ppt. (if the alc. soln. is highly dil. the green color produced by FeCl<sub>3</sub> becomes red on addition of Na<sub>2</sub>CO<sub>3</sub>), forms with HI a gummy mass turning green in alc. with FeCl<sub>3</sub>, does not decomp. carbonates, forms derivs. with AcCl, BzCl,  $\alpha$ -C<sub>10</sub>H<sub>7</sub>NCO, PhNCO and PhCH<sub>2</sub>Cl-NaOEt, gives a red color with Millon's reagent, forms a salt with alc. picric acid, is easily darkened, dried and hardened by MnO<sub>2</sub>, BaO<sub>2</sub>, MgO<sub>2</sub>, PbO, MnOOH and K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, hardens above 96° in the absence of its enzyme or any oxidizing agent, dissolves slightly in aq., completely in alc. KOH, reduces metallic salts (especially AgNO<sub>3</sub>) on heating, NH<sub>3</sub>-AgNO<sub>3</sub> in the cold, is pptd. by Pb(OAc)<sub>2</sub>, forms a green ppt. with Ba(OH)<sub>2</sub>, gives in alc. on gradual addition of alkali a green color changing to red and brownish red with more alkali, reacts violently with concd. HNO<sub>3</sub>, is sol. in most of the org. solvents and concd. alkalies, is pptd. from alc. by Pb(OAc)<sub>2</sub>, AgNO<sub>3</sub>, HgNO<sub>3</sub>, Cu(OAc)<sub>2</sub>, FeCl<sub>3</sub>, Ba(OH)<sub>2</sub>, Br, I, PtCl<sub>4</sub>, AuCl<sub>3</sub>, U acetate and Cu(NO<sub>3</sub>)<sub>2</sub>. C. A. ROUILLER

**4-Methylbenzophenone chloride and its condensation with phenol.** F. C. HAHN. *J. Am. Chem. Soc.* 43, 175-9(1921); cf. Gomberg and Todd, C. A. 11, 3267.—*p*-MeC<sub>6</sub>H<sub>4</sub>CCl<sub>2</sub>Ph (A), from MeC<sub>6</sub>H<sub>4</sub>COPh heated 1-2 hrs. at 110-20° with a slight excess of PCl<sub>5</sub> and freed from the POCl<sub>3</sub> and excess of PCl<sub>5</sub> at 120° *in vacuo*, is a light yellow oil easily hydrolyzed back to the ketone; 12.6 g. in 150 cc. C<sub>6</sub>H<sub>6</sub> warmed gently with 12 g. in PhOH on the H<sub>2</sub>O bath under a reflux for 3-4 hrs. gives 60-5% *p*-tolyl-phenylidiphenoxymethane, crystals from 95% alc. and a little H<sub>2</sub>O, m. 134°, decompd. by boiling 10% HCl into MeC<sub>6</sub>H<sub>4</sub>COPh and PhOH, also on long standing. If 11 g. PhOH and 11 g. A are allowed to stand, protected from moisture, at room temp. for 1-2 days with frequent shaking, then treated with 50 cc. H<sub>2</sub>O, distd. with steam to remove the excess of PhOH, slightly warmed with 5% NaOH, filtered, freed of all traces of MeC<sub>6</sub>H<sub>4</sub>COPh with Et<sub>2</sub>O and of Et<sub>2</sub>O with air, dild. several times with H<sub>2</sub>O and pptd. with CO<sub>2</sub>, there is obtained 80-5% of *p*-methyl-*p*-hydroxytriphenylcarbinol

as a yellow powder very sol. in all the ordinary org. solvents except Et<sub>2</sub>O and sepg. from all as an oil; the Ac and Bz derivs. could not be crystd. The carbinol was also prepd. by condensing  $p\text{-EtO}_2\text{COC}_6\text{H}_4\text{COCl}$  with  $\text{C}_6\text{H}_5$  in the presence of  $\text{AlCl}_3$ , sapon. the product to  $p\text{-HOC}_6\text{H}_4\text{COPh}$  and treating with  $p\text{-MeC}_6\text{H}_4\text{MgBr}$ . Because of the difficulty of crystg. the carbinol the usual methods for the prepn. of the 2 desmotropic forms were of no avail, but an amorphous form, resembling to a greater degree the quinoid modification, was obtained by allowing 5 g. of the benzenoid form to stand in a little glacial AcOH for 0.5 hr. and then pouring it into 200 cc. ice H<sub>2</sub>O; it seps. as a red-orange powder with the same solubilities as the benzenoid form. Neither form has a definite m. p., the benzenoid melting 77–83°, the quinoid several degrees lower. Evidence of the existence of 2 tautomers is furnished by the fact that the quinoid form loses H<sub>2</sub>O more rapidly (3.48 and 5.90% in 1 and 5 days at 95–100°) than the benzenoid tautomer (1.51 and 4.01%). Both are probably mixts. The third product of the condensation,  $p\text{-methylidi-}p\text{-hydroxytetraphenylmethane}$ , is obtained as a wine-red amorphous powder sol. in most org. solvents except CCl<sub>4</sub> and petr. ether by heating PhOH and A on the H<sub>2</sub>O bath; it is pptd. from alkalies by CO<sub>2</sub> or AcOH.

CHAS. A. ROUVIER

**Phenylacetic-*p*-arsonic acid.** GEORGE ROSS ROBERTSON AND JULIUS STIEGLITZ. *J. Am. Chem. Soc.* 43, 179–81 (1921).—Work has been started on the study of the prepn. of arsenicals other than arspenamine and neo-arsphenamine which might lead to an equally efficient and less dangerous drug. As a first series in this direction it is intended to use the CO<sub>2</sub>H group of  $\text{PhCH}_2\text{CO}_2\text{H}$  as the salt-forming group instead of the phenol group of arspenamine in order to avoid the sensitiveness of the aromatic nucleus to oxidation.  $\text{PhCH}_2\text{CN}$  can be nitrated with the ordinary nitrating mixt. (400 cc. concd. HNO<sub>3</sub> and 300 cc. concd. H<sub>2</sub>SO<sub>4</sub> to 125 g. nitrile) with as a good yield as with the more expensive fuming HNO<sub>3</sub>; the crude mixt. of *o*-, *m*- and *p*-comps. is pressed and recrystd. once from 95% and twice from 80% alc. From 100 g. of the *p*-compd. heated 1 hr. under a reflux with 900 cc. H<sub>2</sub>SO<sub>4</sub> (70% by wt.) is obtained 91%  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CO}_2\text{H}$ , m. 151–2°; 20 g. of this in a little warm dil. NH<sub>4</sub>OH stirred into about 8 mols. com. FeSO<sub>4</sub> in 300 cc. boiling H<sub>2</sub>O, cautiously made alk. with concd. NH<sub>4</sub>OH, boiled actively for 10 min. and filtered into 30 cc. glacial AcOH gives 75–7% of the NH<sub>2</sub> acid, 12.25 g. of which in 90 cc. of 4 *N* HCl, diazotized cold with 5.75 g. NaNO<sub>2</sub> and poured in a fine stream into 8.25 g. As<sub>2</sub>O<sub>3</sub> and 58 g. anhydrous Na<sub>2</sub>CO<sub>3</sub> in 400 cc. H<sub>2</sub>O at 50° to which has been added a colloidal suspension of CuOH prepd. by passing a 2–4 amp. current between 2 Cu strips in a mixt. of 15 g. NaCl and 50 g. ice until the ice is melted, is obtained 20% phenylacetic-*p*-arsonic acid, leaflets from H<sub>2</sub>O, slightly sol. in cold, very sol. in hot H<sub>2</sub>O and in alc., m. quietly if suddenly placed in a bath at 195° but on slow heating does not m. 270°. Neutralized with alkali and heated with Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> it gives a light yellow ppt. sol. in Na<sub>2</sub>CO<sub>3</sub>. C. A. R.

**Alkylcyanoacetic esters.** JOHN C. HESSLER AND ROBERT M. LAMB. *J. Am. Chem. Soc.* 43, 205–8 (1921); cf. C. A. 10, 1196.—When 50 g. NCCH<sub>2</sub>CO<sub>2</sub>Et in 200 cc. MeOH is allowed to stand 15 min. with 10.15 g. Na in 200 cc. MeOH and then treated with 44 g. EtI (the temp. rises to 45°) there is obtained after 36 hrs. 24.7 g. of an oil *b*<sub>34</sub> 102–5°, which when shaken in Et<sub>2</sub>O with 10% NaOH gives 9.8 g. methyl diethylcyanoacetate (A), *b*<sub>34.4</sub> 103–5°, *b*<sub>74.3</sub> 205–6°, *d*<sub>41</sub> 0.977, while the NaOH soln. yields 0.2 g. EtCH(CN)CO<sub>2</sub>H (B), *b*<sub>34</sub> 167°. On the other hand, 20 g. NCCH<sub>2</sub>CO<sub>2</sub>Me with NaOEt and EtBr in EtOH gives 22 g. crude product, *b*. 202–5°, sepd. as above into 7.1 g. A and 5.7 g. B; in this case there is no exchange between the alkyl radical of the ester and the alc. used as solvent. From 25 g. NCCH<sub>2</sub>CO<sub>2</sub>Et in *iso*-AmOH with *iso*-AMONa and *iso*-AmI heated 2 hrs. at 130° is obtained 29.5 g. of a product *b*<sub>34</sub> 142–80°, consisting of a mixt. of *iso*amyl *iso*amyl- and *diiso*amylcyanoacetates, as shown by the fact that it is sapond. to *iso*-AmOH and the resp. acids. The *diiso*amylcyano-

acetic acid seps. in plates m. 74-5°; the ester (obtained in 21.5 g. yield),  $b_p$  164-6°,  $d_{20}$  0.9074.

CHAS. A. ROUVIER

**Preparation of 9(10)-phenanthridone from phenanthrene.** LEONE OVSTER with HOMER ADKINS. *J. Am. Chem. Soc.* 43, 208-10(1921).—An attempt was made to prep. a compd. similar to the vat dye indanthrene red-violet 2RN by the following series of reactions: phenanthrene  $\longrightarrow$  phenanthraquinone (A)  $\longrightarrow$  diphenic acid (B)  $\longrightarrow$  diphenic anhydride (C)  $\longrightarrow$  diphenamic acid (D)  $\longrightarrow$  1-amino-10-carboxy-diphenyl (E) and condensation of the last compd. with  $\alpha$ -chloroanthraquinone (F). When, however, it was tried to convert D into E by Hofmann's reaction, 9(10)-phenanthridone (G) was obtained instead. The A, m. 203°, was obtained in 50-3% yield by a modification of Anschütz and Schultz's method (*Ann.* 196, 37(1878)); this, by a modification of Schmitz's method (*Ann.* 193, 116(1878)), gave 53% B, converted according to the directions of Traube and Aubin (*Ann.* 247, 263(1888)), in 92.3% yield, into C, m. 212°, which, by T. and A.'s method, gave 97% D, m. 190°; 25 g. D in 100 cc. of 10% NaOH slowly but immediately treated with 5.1 cc. Br in 140 cc. of 10% NaOH and, after 0.5 hr., with concd. NaHSO<sub>3</sub> and then with 40 cc. of 37% HCl gave 94% G, crystals from alc., m. 291°, insol. in dil. or concd. HCl or in alkalis; condensed with F in boiling PhNO<sub>2</sub> in the presence of finely divided Cu in Na<sub>2</sub>CO<sub>3</sub> or NaOAc it gave 2 products: white crystals, m. 82°, with 11.8% N, and a brick-red powder sol. in alkalis with red and in acids with yellow color and giving on reduction in alk. soln. with Zn and Ca(OH)<sub>2</sub> a beautiful red color which faded on standing and did not dye cotton.

C. A. R.

**Interaction of tin and phenol.** HARPER F. ZOLLER. *J. Am. Chem. Soc.* 43, 211-2(1921).—When 200 g. purified PhOH (leaving no residue upon ignition) and 50 g. Sn in thin strips (0.025 mm. thick) were slowly distd. from a glass still connected with 2 condensers, one with warm H<sub>2</sub>O, the other in ice-CaCl<sub>2</sub>, the residue in the still began to get opalescent after 2 hrs.; PhOH crystd. in the first condenser and about 30 cc. C<sub>6</sub>H<sub>6</sub> collected in the second receiver. The residue in the still, when poured into H<sub>2</sub>O, gave a ppt. which, when washed free of PhOH, proved to be pure SnO<sub>2</sub>. No visible ppt. was formed when PhOH which had stood in contact with Sn at 30° for 18 months was poured into H<sub>2</sub>O. Z. concludes that at temps. above the b. p. of H<sub>2</sub>O, the following reaction occurs:  $2\text{PhOH} + \text{Sn} = 2\text{C}_6\text{H}_6 + \text{SnO}_2$ .

C. A. R.

**Use of phosphoric acid instead of sulfuric acid in melting-point determinations.** ALICE GRAUSTEIN. *J. Am. Chem. Soc.* 43, 212-3(1921).—The unpleasant fuming of H<sub>2</sub>SO<sub>4</sub> at temps. much above 150° may be avoided by using H<sub>3</sub>PO<sub>4</sub> in a bulb of resistance glass, such as Pyrex. Even such a glass is slowly etched but it can be used several months before its transparency is seriously impaired. The opacity produced by the absorption of H<sub>2</sub>O from the air may be relieved by adding more H<sub>2</sub>O and reheating the acid to the highest temp. at which it is to be used. Moreover, any discoloration can be destroyed by adding a few crystals of NaNO<sub>2</sub>.

C. A. R.

**New synthesis of  $\alpha$ -monoglycerides.** EMIL FISCHER, MAX BERGMANN AND HEINRICH BÄRWIND. Univ. Berlin. *Ber.* 53, 1589-1605(1920).—The formation of glycerides from chlorohydrins by heating with soaps at high temps. cannot be taken as a proof of the structure of the glycerides for such reactions are by no means simple and yield considerable amts. of by-products; moreover, it is very doubtful that the reaction is limited to a simple exchange of the halogen for the acid radical; it is more likely that glycide-like compds. are first formed. Nor does the method of formation of glycerides through their halogen derivs. offer greater certainty as to their structure, for in the subsequent replacement of the halogen by HO, which does not take place very readily, changes in structure by shifting of the acid radicals may very well occur (cf. second abstr. following). The method of prepn. described below offers greater guarantees that the products are really  $\alpha$ -glycerides. When 30 g. acetoneglycerol,

which certainly has the structure  $\text{HOCH}_2\text{CH}(\text{CH}_2\text{O.CMe}_2\text{O})$  (see following abstr.),

and 30 g. quinoline at 0° are slowly treated with 38 g.  $\text{BzCl}$ , allowed to stand 15–20 hrs. at room temp. and dild. with  $\text{H}_2\text{O}$  and the pptd. oil is taken up in  $\text{Et}_2\text{O}$ , shaken 10–5 min. with  $\text{K}_2\text{CO}_3$ , then with excess of ice-cold 0.1  $N$   $\text{H}_2\text{SO}_4$  to remove the excess of quinoline, finally with  $\text{H}_2\text{O}$ , and dried with  $\text{K}_2\text{CO}_3$ , there is obtained 48 g. *benzoylacetoneglycerol* (A), almost colorless oil,  $b_{\text{D}}^{20}$  164–5°, monoclinic sphenoidal (?) crystals from petr. ether,  $a:b:c = 1.0221:1:0.4661$ ,  $\beta$  108° 56',  $a(100)$ ,  $c(001)$ ,  $m(110)$ ,  $\rho(101)$ ,  $m$  34.5°, is strongly bitter; 40 g. vigorously shaken with 500 cc. of 0.5  $N$   $\text{HCl}$  at 55–6° until almost completely dissolved (30–40 min.), kept a little longer at the same temp., almost neutralized, cold, with  $\text{KHCO}_3$ , treated with much  $\text{NaCl}$  and repeatedly extd. with  $\text{Et}_2\text{O}$ , yields 22.5 g. of  $\alpha$ -monobenzoylglycerol (B) as an oil solidifying to a cryst. cake after several days in a vacuum desiccator when seeded with a sample made to crystallize by strong cooling and rubbing; after repeated crystn. from petr. ether or  $\text{CCl}_4$ , it  $m$ . 36° (cf. Kraft, *Ber.* 36, 4341(1903)), partially decomp. on distn., even in a high vacuum, into glycerol and an oil consisting chiefly of dibenzoylglycerol; mol. wt. in  $\text{AcOH}$  196; in  $\text{CHBr}_3$  it is strongly associated, 1% solns. giving more than double the calcd. mol. wt.; 1 g. in 10 parts dry  $\text{Me}_2\text{CO}$  containing 1%  $\text{HCl}$  shaken 16 hrs. with 1 g. ignited  $\text{Na}_2\text{SO}_4$ , then freed from  $\text{HCl}$  with  $\text{PbCO}_3$ , gives 0.85 g. A, showing that the two free HO groups in B are adjacent (see following abstr.), i. e., that B is really an  $\alpha$ -glyceride. *Diphenylurethan*, obtained almost quant. by allowing 1 g. B and 1.82 g.  $\text{PhNCO}$  to stand 4 days at room temp. (yield, 67% after recrystn. from 8 parts alc.), needles,  $m$ . 135–6°. *p*-Nitrobenzoylacetoneglycerol (19 g. from 15 g.  $\text{O}_2\text{NC}_6\text{H}_4\text{COCl}$  and 13 g. quinoline in 25 cc.  $\text{CHCl}_3$  allowed to stand 1–2 days with 10.7 g. acetoneglycerol), bitter leaflets from petr. ether,  $m$ . 56°; 10 g. gives with 0.5  $N$   $\text{HCl}$  at 75–80° 7.3 g. of the free  $\alpha$ -*p*-nitrobenzoylglycerol, faintly yellow prisms from  $\text{CHCl}_3$ ,  $m$ . 107°, is odorless, tastes bitter and is reconverted into the acetone compd. by  $\text{Me}_2\text{CO-HCl}$  (68.4% yield); 7.2 g. with 5 g.  $\text{C}_6\text{H}_5\text{N}$  in 35 cc.  $\text{CHCl}_3$  slowly treated at 20° with 8.4 g.  $\text{BzCl}$  and 5 cc.  $\text{CHCl}_3$ , taken up in much  $\text{Et}_2\text{O}$  after 2 days and shaken with ice-cold dil.  $\text{H}_2\text{SO}_4$  yields 12.8 g.  $\alpha$ -*p*-nitrobenzoyl- $\alpha'$ , $\beta$ -dibenzoylglycerol, quadrangular needles from alc.,  $m$ . 114°. *Stearylacetoneglycerol* (11.7 g. from 6 g. acetoneglycerol, 5.4 g. quinoline and 11.4 g. stearyl chloride ( $b_{\text{D}}^{20}$  164–6°)), long needles from alc., sinters faintly 37°,  $m$ . 40–1°; 3 g. in 15 cc.  $\text{Et}_2\text{O}$  with 15 cc.  $\text{HCl}$  (d. 1.19) at 20–5° gives 2.5  $\alpha$ -monostearyl glycerol,  $m$ . 81–2° and after resolidifying  $m$ . 75–6°; if the 81–2° form is crystd. from alc. and allowed to stand in contact with the mother liquors for some time it melts 1–2° lower, and if a soln. of 0.1 g. in 10 cc.  $\text{Et}_2\text{O}$  is cooled as quickly as possible there seps. a fine cryst. ppt. of the same compn. but  $m$ . 76–7° and showing the same  $m$ . p. after resolidification, but if slowly recrystd. from  $\text{Et}_2\text{O}$  it seps. in the higher-melting form. It is reconverted into the acetone compd. by  $\text{Me}_2\text{CO-HCl}$  (yield, 63%). *Laurylacetoneglycerol* (yield, over 75%), mobile faintly yellow oil,  $b_{\text{D}}^{20}$  151–2°,  $n_{\text{D}}^{20}$  1.4454,  $d_4^{20}$  0.9537, solidifies to a snow-white cryst. mass  $m$ . 8–9°; 9 g. in 45 cc.  $\text{Et}_2\text{O}$  at –15° treated with 45 cc.  $\text{HCl}$  (d. 1.19) in small amts. but quite rapidly and, after 7–8 min., with 200 cc. cold  $\text{H}_2\text{O}$  and allowed to stand 25 min. longer in the freezing mixt. gives 7.7 g.  $\alpha$ -monolaurylglycerol,  $m$ . 62–3°, leaflets with fatty luster from petr. ether and  $\text{CCl}_4$ ; 3 g. in 120 cc. of 1%  $\text{HCl}$  in  $\text{Me}_2\text{CO}$  shaken 2 days with 6 g. freshly ignited  $\text{Na}_2\text{SO}_4$ , freed from  $\text{HCl}$  with  $\text{Ag}_2\text{CO}_3$ , evapd. *in vacuo*, taken up in  $\text{Et}_2\text{O}$ , filtered through charcoal, again evapd. and extd. at –15° with petr. ether (which leaves 0.3 g. monolauryl undissolved) yields 64% of the acetone compd.; heated a few min. with  $\text{PhNCO}$  at 60° and allowed to stand 3 days at room temp. it yields quant. the *diphenylurethan*,  $m$ . 87–9° after 3 recrystns. from petr. ether, but when 0.1 g. is boiled 15 min. in 25 cc. petr. ether and allowed to cryst. slowly it  $m$ . 92–4°; this sample, however, after standing 2 months in a tube

of ordinary lab. glass again m. 87-9°. The lack of agreement with Grün's observations, who describes two forms of monolaurin,  $\alpha$ , m. 52°, and  $\beta$ , 58.5°, the former of which does not react with PhNCO while the latter forms a monophenylurethan (C. A. 4, 2478), cannot be explained.  $\alpha$ -Lauro- $\alpha'$ , $\beta$ -distearin (2 g. from 1 g. of the monolaurin in 1 cc. CHCl<sub>3</sub> treated below 30° with 1.2 g. stearyl chloride and 0.6 g. quinoline in 1 cc. CHCl<sub>3</sub> and allowed to stand several days), felted needles from Et<sub>2</sub>O-EtOH, m. 49-50°. *Palmitylacetoneglycerol* (15 g. from 12 g. palmityl chloride (b<sub>0.8</sub> 162-3°)), slender leaflets from alc., m. 34-5°; 5 g. gives in Et<sub>2</sub>O with HCl (1.19) after 25-30 min. at 20° 4.2 g.  $\alpha$ -monopalmitylglycerol, leaflets with fatty luster on slow crystn. from Et<sub>2</sub>O, m. 78-9°, seps. on rapid crystn. in a lower-melting form (74-5°) which, after resolidification, m. 71-2°.  $\alpha$ -Palmito- $\alpha'$ , $\beta$ -dilaurin (yield, 87%), fatty leaves from alc., sinters slightly 45°, m. 47-8°.

CHAS. A. ROUILLER

**Glycerolacetone and its applicability for the preparation of pure  $\alpha$ -glycerides;** a phosphoric acid compound of glycol. EMIL FISCHER AND ERNST PFÄHLER. Univ. Berlin. Ber. 53, 1806-21(1920).—The method of making acetoneglycerol (A) (see preceding abstr.) has been improved: 100 g. anhydrous glycerol is shaken 12 hrs. with 600 cc. Me<sub>2</sub>CO containing 1% HCl and 40 g. ignited and powdered Na<sub>2</sub>SO<sub>4</sub>, then freed of most of the HCl with PbCO<sub>3</sub>, filtered, treated with a little Ag<sub>2</sub>O and fractionated; yield, 112 g. b<sub>11</sub> 82.5°, d<sub>4</sub><sup>20</sup> 1.0678, n<sub>D</sub><sup>20</sup> 1.43509.  $\alpha$ -Chlorohydrin, b<sub>10</sub> 113°, is obtained in 96 g. yield from 100 g. epichlorohydrin refluxed 14 hrs. with 100 cc. H<sub>2</sub>O; shaken with Me<sub>2</sub>CO-HCl and Na<sub>2</sub>SO<sub>4</sub> for 22 hrs. it gives 60% *acetoneglycerol- $\alpha$ -chlorohydrin* (B), ClCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O.CMe<sub>2</sub>O, b<sub>107</sub> 157°, d<sub>4</sub><sup>15</sup> 1.109, n<sub>D</sub><sup>15</sup> 1.43750, solidifies

to a cryst. mass when cooled to -60° and m. -13° to -10°; it holds its Cl very firmly, remaining unchanged when heated 4 hrs. with KOH in aq. Me<sub>2</sub>CO at 100° and being only very slightly attacked when shaken 12 hrs. with excess of aq. KOH at 125° or heated with NH<sub>3</sub> in MeOH at 100°, but the acetone radical is very easily split off by warm dil. aq. acids; the same decompn. is produced, although much more slowly, by hot alc. NaI; at the same time considerable  $\alpha$ -iodohydrin, scales from CHCl<sub>3</sub>-petr. ether, m. 49-50°, is formed (8 g. from 20 g. B heated 3 hrs. at 100° with 40 g. NaI in 120 cc. alc.). *Acetoneglycerol- $\alpha$ -iodohydrin* (C) (20 g. from 20 g. of iodohydrin), b<sub>10</sub> 79°, d<sub>4</sub><sup>18.6</sup> 1.648, n<sub>D</sub><sup>18.6</sup> 1.50460; unlike B the halogen in C is quite labile; thus, 9.7 g. C boiled 45 hrs. with 6.4 g. CH<sub>3</sub>(CO<sub>2</sub>Et)<sub>2</sub>, 0.9 g. Na and 40 cc. alc. gives 4.7 g. *diethyl [acetone- $\beta$ , $\gamma$ -dioxypropyl]malonate*, b<sub>10</sub> 155-6°, hydrolyzed by aq. alc. NaOH at room temp. to the free acid which was isolated as the lead salt, ppt. changing in 12 hrs. to broad needles or plates with 1 H<sub>2</sub>O, or as the calcium salt, needles with 2.5 H<sub>2</sub>O. All attempts to obtain an acetone compd. of CH<sub>2</sub>(CH<sub>2</sub>OH)<sub>2</sub> failed, indicating that A really has the structure assigned to it in the preceding abstr. and can hardly contain any appreciable amt. of a substance CH<sub>2</sub>CH(OH).CH<sub>2</sub>O.CMe<sub>2</sub>O. *Acetylacetoneglycerol*

(7.2 g. from 5.1 g. Ac<sub>2</sub>O, 4 g. C<sub>6</sub>H<sub>5</sub>N and 6.6 g. A kept 12 hrs. at room temp.), b<sub>8</sub> 84°, b<sub>12</sub> 87°, has a peculiar but not very strong odor and a disagreeable taste, d<sub>4</sub><sup>15</sup> 1.0770, n<sub>D</sub><sup>15</sup> 1.42881; 10 g. shaken 5 min. with 20 cc. 0.25 N H<sub>2</sub>SO<sub>4</sub> at 45°, kept 25 min. longer at 45°, quickly cooled to 0°, treated with a slight excess of Ba(OH)<sub>2</sub>, then with CO<sub>2</sub> to ppt. the excess of Ba, evapd. without filtering at 30-5°, taken up in CHCl<sub>3</sub>, filtered from the BaCO<sub>3</sub>, dried with Na<sub>2</sub>SO<sub>4</sub> and freed from the CHCl<sub>3</sub> *in vacuo* quant. gives  $\alpha$ -acetylgycerol (D), b<sub>0.4</sub> 103° (slight decompn.); all previous preps. described, which were distd. under 10 or more mm., must have been more or less impure. Like all  $\alpha$ -glycerides it is easily reconverted into the acetone compd. (3 g. from 5 g. D).  *$\alpha$ -Acetyl- $\alpha'$ , $\beta$ -di-[p-nitrobenzoyl]glycerol* (23 g. from 7.5 g. D and 10 g. C<sub>6</sub>H<sub>5</sub>N treated at -10° with 22 g. O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>COCl in 50 cc. CHCl<sub>3</sub> and allowed to stand 22 hrs. at room temp.), triangular microplatelets from alc., m. 129-30°; attempts to split off the Ac

group by allowing 5 g. in 100 cc.  $\text{Me}_2\text{CO}$  to stand 21 hrs. with 75 cc.  $\text{MeOH}$  satd. at  $0^\circ$  with  $\text{NH}_3$  resulted in complete hydrolysis, 3.5 g.  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{Me}$  being isolated. When 15.3 g.  $\text{POCl}_3$  and 50 cc. quinoline at  $-20^\circ$  are treated in the course of 0.5 hr. with 13.2 g. D in 20 cc. quinoline, allowed to stand 1 hr. longer at  $-20^\circ$ , slowly warmed to room temp., poured into 800 cc. ice  $\text{H}_2\text{O}$  and 70 cc. of 25%  $\text{H}_2\text{SO}_4$ , freed from  $\text{HCl}$  with  $\text{Ag}_2\text{CO}_3$  and of  $\text{Ag}$  with  $\text{H}_2\text{S}$ , treated with 100 g. finely powdered cryst.  $\text{Ba}(\text{OH})_2$ , freed of the excess of  $\text{Ba}$  with  $\text{CO}_2$ , evapd. *in vacuo* below  $49^\circ$ , taken up in 800 cc. cold  $\text{H}_2\text{O}$ , filtered from the traces of  $\text{BaCO}_3$ , concd. below  $40^\circ$  to about 120 cc., treated slowly with 120 cc. alc. and cooled to  $0^\circ$ , there is obtained 33 g. of *barium acetoneglycerolphosphate* (E),  $\text{O.CMe}_2\text{O.CH}_2\text{CHCH}_2\text{OPO}_3\text{Ba.3H}_2\text{O}$ , fatty scales, 3.64

g. of which (anhydrous) dissolve in 100 g.  $\text{H}_2\text{O}$  at  $25^\circ$ ; *silver salt*, fine needles quickly becoming gray in the light; 5 g. of the hydrated  $\text{Ba}$  salt in 130 cc.  $\text{H}_2\text{O}$  heated 15 min. at  $100^\circ$  with 35 cc. of  $N$   $\text{H}_2\text{SO}_4$ , quickly cooled, treated with 7 g. crystd.  $\text{Ba}(\text{OH})_2$ , then with  $\text{CO}_2$  to remove the excess of  $\text{Ba}$ , evapd. below  $40^\circ$  under 10–5 mm., and crystd. from  $\text{H}_2\text{O}$  gives 3.5 g.  $\text{Ba}$   $\alpha$ -glycerylphosphate, sol. to the extent of 1.26–1.3% in  $\text{H}_2\text{O}$  at  $22^\circ$ ; the difference between this value and that (1.83%) given by Bailly C. A. 12, 1549) is probably explained by the existence of the easily sol. form. for this is produced by simple soln. of the crystd. salt whose solns. can be greatly concd. under low pressures and at low temps. without the salt sepg.; these concd. solns. can be used for the prepn. of other salts. *Silver salt*, fine needles quickly turning gray in the light when moist. The mother liquors of E, when evapd. *in vacuo* at  $40^\circ$  and slowly crystd. from  $\text{MeOH}$ , yield 0.8 g. *barium di[acetoneglyceryl]phosphate* (F) which is obtained in much better yield by using  $\text{C}_6\text{H}_5\text{N}$  instead of quinoline in the phosphorization; 6.6 g. A in 20 cc.  $\text{C}_6\text{H}_5\text{N}$  and 3.9 g.  $\text{POCl}_3$  in 10 cc.  $\text{C}_6\text{H}_5\text{N}$  are allowed to stand 1.5 hrs. at  $-20^\circ$ , then 0.5 hr. without cooling, giving 2.4 g. E and 4 g. F, silky needles from  $\text{MeOH}$ , forms in  $\text{CHCl}_3$  with  $\text{Et}_2\text{O}$  a thick clear jelly, yields no ppt. in  $\text{H}_2\text{O}$  with  $\text{Pb}$ ,  $\text{Ag}$  and  $\text{Hg}$  salts; 3 g. in 30 cc.  $\text{H}_2\text{O}$  kept 12 min. at  $60^\circ$  with 11 cc. of  $N$   $\text{H}_2\text{SO}_4$  yields 2.2 g. *barium diglycerylphosphate*, amorphous powder giving no ppt. in  $\text{H}_2\text{O}$  with  $\text{Ag}$ ,  $\text{Pb}$ ,  $\text{Hg}$ ,  $\text{Cu}$  or  $\text{Zn}$  salts. *Barium glycolchlorohydrinphosphate*  $\text{ClCH}_2\text{CH}_2\text{OPO}_3\text{Ba.3H}_2\text{O}$  (8 g. from 3.1 g. glycol in 20 cc.  $\text{C}_6\text{H}_5\text{N}$  and 15.3 g.  $\text{POCl}_3$  in 40 cc.  $\text{C}_6\text{H}_5\text{N}$  kept 1.5 hrs. at  $-20^\circ$ ), lancet-shaped needles from  $\text{MeOH-H}_2\text{O}$ ; *silver salt*, needles becoming gray in the light.

CHAS. A. ROULLER

**Migration of the acyl in glycerides.** EMIL FISCHER. Univ. Berlin. *Ber.* 53, 1621–33 (1920).—Many conclusions as to the structures of mono- and diglycerides and of mixed triglycerides have been based on the assumption that in their synthesis acyl groups already present in the mol. retain their position unchanged even when other groups, like halogens, are removed by substitution, but proof has now been obtained that, as in the case of the phenolcarboxylic acids (C. A. 12, 1968), migration of these acyl groups may occur. If a monoacylglycerol,  $\text{ROCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$ , is treated with an acid chloride,  $\text{R}'\text{Cl}$ , in quinoline or  $\text{C}_6\text{H}_5\text{N}$  at room temp. there is formed apparently very smoothly and in good yield a mixed triglyceride (A) to which would naturally be assigned the structure  $\text{ROCH}_2\text{CH}(\text{OR}')\text{CH}_2\text{OR}'$ .  $\text{ICH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$  (B) similarly treated gives a diglyceride,  $\text{ICH}_2\text{CH}(\text{OR}')\text{CH}_2\text{OR}'$ , in which the I is easily replaced by HO. When the acyl group R is introduced into this HO deriv., the product is not identical with A, as would be expected, but an isomer of higher m. p. and smaller soly. This can be possible only if in one of the above reactions there has been a migration of an acyl group. F. believes that in the removal of the I the  $\beta$ -acyl group migrates to the  $\alpha$ -position, yielding an  $\alpha,\alpha'$ -diglyceride and that the final triglyceride has the structure  $\text{ROCH}(\text{CH}_2\text{OR}')_2$ . The mechanism of the migration is at present entirely undetd.; possibly, when the I is removed there is first formed an intermediate product,  $\text{RCO}_2\text{CH}_2\text{CH}(\text{CH}_2\text{O.C}(\text{OH})\text{R.O. } \alpha,\beta\text{-Di-}[p\text{-nitrobenzoyl}]\text{-}\alpha'\text{-ido-}$

*hydrin* (11.3 g. from 5 g. **B** in 4.5 g.  $C_6H_5N$  treated at  $0^\circ$  with 9.3 g.  $p\text{-O}_2NC_6H_4COCl$  in 20 cc.  $CHCl_3$  and allowed to stand 18 hrs. at room temp.), lancet-shaped needles from  $Me_2CO$ , m.  $102\text{--}3^\circ$ ; 3 g. refluxed 1 hr. in 40 cc.  $PrOH$  with 2 g.  $AgNO_3$  and 5 cc.  $H_2O$  gives 2.1 g.  $\alpha, \alpha'$ -di-[*p*-nitrobenzyl]glycerol (**C**), slender 4-cornered rhombic leaflets from 80% aq.  $Me_2CO$  or abs. alc., m.  $136\text{--}7^\circ$ , also obtained in 0.4 g. yield by heating 1 g. of the iodohydrin in 10 cc.  $AcOH$  with 1 g.  $AgOAc$  20 min. on the  $H_2O$  bath; 1 g. in 1.2 cc.  $C_6H_5N$  kept 18 hrs. at room temp. with 0.8 cc.  $Ac_2O$  yields 1 g. of the  $\beta$ -acetyl derivative, long needles from 170 parts alc. or 12-4 parts  $Me_2CO$ , m.  $161^\circ$ , soly. in 100 g.  $Me_2CO$  at  $21^\circ$ , 2.34 g.  $\alpha, \beta$ -Distearyl- $\alpha'$ -iodohydrin (13.5 g. from 4 g. **B** and 12.7 g. stearyl chloride), needles from  $Et_2O$ - $MeOH$ , m.  $52\text{--}3^\circ$ , converted by boiling 0.5 hr. in  $EtOH$  with  $AgNO_3$  into  $\alpha, \alpha'$ -distearin (77% yield), broad needles or platelets from  $Et_2O$ , m.  $78.5\text{--}9^\circ$ , which with  $Ac_2O$  in  $C_6H_5N$  gives the  $\beta$ -acetate, silky needles from  $Et_2O$ , m.  $64^\circ$ , soly. in 100 g.  $Me_2CO$  at  $21^\circ$ , 0.201 g.  $\alpha$ -Acetyl- $\alpha', \beta$ -distearylglycerol (7.8 g. from 1.6 g. monoacetin and 7.8 g. stearyl chloride), needles from  $Me_2CO$ , m.  $59^\circ$ , soly. in 100 g.  $Me_2CO$  at  $21^\circ$ , 0.341 g.  $\alpha$ -Benzoyl- $\alpha', \beta$ -di-[*p*-nitrobenzyl]glycerol (8 g. from 3.9 g.  $\alpha$ -benzoylglycerol and 7.4 g.  $p\text{-O}_2NC_6H_4COCl$ ), long needles from  $Et_2O$ , m.  $122\text{--}3^\circ$ , soly. in 100 g.  $Me_2CO$  at  $21^\circ$ , 9.6 g.  $\beta$ -Benzoyl- $\alpha, \alpha'$ -di-[*p*-nitrobenzyl]glycerol (1.8 g. from 1.8 g. **C** and 0.65 g.  $BzCl$ ), long quadrangular rodlets, m.  $152\text{--}2.5^\circ$ , soly. in 100 g.  $Me_2CO$  at  $21^\circ$ , 3.7 g.  $\alpha$ -*p*-Nitrobenzoyl- $\alpha', \beta$ -distearylglycerol (7.4 g. from 2.4 g. nitrobenzoylglycerol and 6.1 g. stearyl chloride), silky needles, m.  $74.5^\circ$ .  $\beta$ -*p*-Nitrobenzoyl- $\alpha, \alpha'$ -distearylglycerol, silky needles, m.  $61^\circ$ .  $\alpha, \beta$ -Dibenzoyl- $\alpha'$ -iodohydrin (18 g. from 10 g. **B** and 14 g.  $BzCl$ ), long needles from alc.-petr. ether, m.  $56\text{--}7^\circ$ . *p*-Nitrobenzoyldiiodohydrin (6.7 g. from 6.2 g. "Jothion" (a com. liquid diiodohydrin (probably  $\alpha, \alpha'$ )) and 3.7 g.  $O_2NC_6H_4COCl$ ), 4-sided microprisms from  $EtOH$ - $Me_2CO$ , m.  $82\text{--}3^\circ$ , loses all its **I** as  $AgI$  when boiled in  $PrOH$  and a little  $H_2O$  with  $AgNO_3$ . C. A. R.

**Two isomeric chlorotetracetyl- $\beta$ -fructoses.** F. M. JAEGER. Univ. Groningen. *Proc. Acad. Sci. Amsterdam*, 23, 342-6(1920).— $\alpha$ -Chlorotetracetyl- $\beta$ -fructose,  $C_6H_7O_5Cl$  (**A**), was prepd. by adding 7.5 g. anhydrous  $AlCl_3$  to 30 g. freshly recrystd. and dried  $\beta$ -tetraacetyl fructose in 90 cc. dry  $CHCl_3$ , cooled to  $0^\circ$ ; 19 g.  $PCl_5$  are added, after which the soln. is allowed to rise to room temp. during 30 min. with stirring; it is then rapidly cooled, washed with  $NaHCO_3$  soln. containing ice, then with ice-water. The  $CHCl_3$  is dried over  $CaCl_2$ , filtered and evapd. under a glass bell with a current of dry air; the sepd. material is pressed between paper and dissolved in dry  $Et_2O$ , from which colorless needles or prisms, m.  $83^\circ$ , deposit on standing in an ice box. Yield 60-5%. The following measurements were made:  $a:m = (100):(110) = 44^\circ 18'$ ;  $r:r = (101):(\bar{1}01) = 37^\circ 12'$ ;  $m:b = (110):(010) = 45^\circ 44'$  (calcd.  $45^\circ 42'$ );  $m:m = (110):(\bar{1}\bar{1}0) 91^\circ 28'$  (calcd.  $91^\circ 24'$ );  $a:r (100):(101) 71^\circ 24'$  (calcd.  $71^\circ 24'$ );  $r:m (101)(110) 77^\circ 10'$  (calcd.  $76^\circ 18.3'$ );  $r:m (101):(\bar{1}\bar{1}0) 77^\circ 2'$  (calcd.  $76^\circ 18.3'$ ).  $\beta$ -Chlorotetracetyl- $\beta$ -fructose is prepd. the same as **A** but without  $AlCl_3$ ; after evapn. of  $CHCl_3$ , abs.  $EtOH$  is added and crysts. sepd.; repeatedly recrystd. from hot abs.  $EtOH$ ; larger crysts. from  $PhH$ ; m.  $83^\circ$ . The following measurements were made:  $a:m = (100):(110) = 60^\circ 13.3'$ ;  $a:r = (110):(101) = 67^\circ 51.5'$ ;  $m:m (110):(\bar{1}\bar{1}0) 59^\circ 33'$  (calc.  $59^\circ 33'$ );  $r:r = (101):(\bar{1}01) = 44^\circ 17'$  (calcd.  $44^\circ 17'$ );  $r:m = (101):(110) = 79^\circ 10'$  (calcd.  $79^\circ 12.75'$ );  $o:m = (523):(110) = 50^\circ 56'$  (calcd.  $51^\circ 51'$ );  $o:o = (523):(\bar{5}23) = 48^\circ 50'$  (calcd.  $49^\circ 12.5'$ );  $o:o = (523):(\bar{5}23) = 117^\circ 30'$  (calcd.  $117^\circ$ ). There is no distinct form analogy present between the two isomeric compds.; the substitution of a **Cl** atom for a **H** atom does not lower the degree of symmetry of the original substance, the acetyl derivs. being rhombic-bisphenoidal. N. A. LANGE

**The crystal forms of some substituted amides of *p*-toluenesulfonic acids.** F. M. JAEGER. Univ. Groningen. *Proc. Acad. Sci. Amsterdam* 23, 347-62(1920).—Distinct relations in the crystal forms of these derivs. were not found in great numbers. The observed measurements are given in detail with the table following as a summary:

Compound.	M. P.	Symmetry.	Axial ratio. $\beta = 87^{\circ} 29'$	Spec. Volume.	Optical parameters.
<i>p</i> -Toluenesulfonamide.....	137.5	Mon. prism.	$\beta = 87^{\circ} 29'$ 1.2016:1:0.9364	.....	.....
Nitro- <i>p</i> -toluenesulfonamide.....	141	Mon. prism. (pseudo-rhomb)	1.2289:1:1.1812 $\beta = 90^{\circ}$	133.99	5.5537; 4.5194; 5.3383
<i>N</i> -Methyl- <i>p</i> -toluenesulfonamide.....	76	Rhomb. bipyrr.	1.0358:1:2.6074 1.0522:1:0.3948	138.06	3.8442; 3.7113; 9.6770
<i>N</i> -Methyl-nitro- <i>p</i> -toluenesulfonamide	91	Mon. prism.	$\beta = 86^{\circ} 40.5'$ 1.3210:1:0.6892	154.21	7.5664; 7.1910; 2.8390
<i>N</i> -Methyl- <i>N</i> -nitro- <i>p</i> -toluenesulfonamide.....	60	Mon. prism.	$\beta = 78^{\circ} 6'$ 0.6481:1:0.4136	165.00	7.5309; 5.7009; 3.9291
<i>N</i> -Ethyl- <i>p</i> -toluenesulfonamide.....	64	Tricl. (pediad)	$\alpha = 77^{\circ} 39'$ ; $\beta = 88^{\circ} 6'$ ; $\gamma = 102^{\circ} 55'$ 1.0149:1:0.6762	152.26	4.6905; 8.4202; 3.4825
<i>N</i> -Diethyl- <i>p</i> -toluenesulfonamide.....	59	Mon. prism.	$\beta = 72^{\circ} 1'$ 1.0178:1:1.1005	184.55	6.6611; 6.5633; 4.4381
<i>N</i> -Ethyl- <i>N</i> -nitro- <i>p</i> -toluenesulfonamide	69	Mon. prism.	$\beta = 88^{\circ} 11'$ 0.4812:1:0.8766	168.27	5.4115; 5.3169; 5.8513
<i>N</i> -Ethyl- <i>N</i> , <i>p</i> -dinitro- <i>p</i> -toluenesulfonamide	76	Mon. (sphenoid)	$\beta = 85^{\circ} 5'$ 0.9778:1:0.8991	156.91	3.4652; 7.2001; 6.3119
<i>N</i> -Benzyl- <i>p</i> -toluenesulfonamide.....	113	Tricl. pinac.	$\alpha = 83^{\circ} 24.5'$ ; $\beta = 91^{\circ} 33'$ ; $\gamma = 95^{\circ} 26'$ 1.8095:1:1.3139	198.78	5.9793; 6.1150; 5.4981
<i>N</i> -Benzyl- <i>N</i> , <i>p</i> -dinitro- <i>p</i> -toluenesulfonamide.....	153	Tricl. pinac.	$\alpha = 100^{\circ} 50'$ ; $\beta = 104^{\circ} 43'$ ; $\gamma = 65^{\circ} 33'$ 0.7474:1:0.3790	229.54	8.6739; 4.7934; 6.2983
<i>p</i> -Toluenesulfonylpiperidine.....	98	Rhomb. bipyrr.	0.7466:1:1.5713 $\beta = 78^{\circ} 39'$	186.57	6.5629; 8.7005; 3.2976
Nitro- <i>p</i> -toluenesulfonylpiperidine....	108	Mon. prism.		205.20	4.2031; 5.6295; 8.9455 N. A. LANGR



**Free thiocyanogen.** CLARENCE J. WEST. *Chem. Met. Eng.* 23, 925(1920).—A brief review of the work reported in *C. A.* 14, 1808. C. J. WEST

**Tetralin and other hydrogenated naphthalenes.** FRANZ. *Kunststoffe* 10, 185-7 (1920).—Review of patent and other literature. C. J. WEST

**The oxidation of paraffin to fatty acids.** F. H. VAN LEENT. *Olief en Vetten* 5, 312-4(1920).—A review. NATHAN VAN PATTEN

Chemistry and pharmacology of digitoxin and its cleavage products (CLOETTA) 11H. The anthocyanins of *Beta vulgaris* and *Raphanus sativus* (SCHUDEL) 11D. Technical production of picric acid (BLECHTA) 24. Pulp and other products from western larch (galactan, mucic and oxalic acids) (U. S. pat. 1,364,418) 23.

ERRERA, GIORGIO: Trattato di chimica organica. Vol. I. Combinazioni della serie grassa. Palermo: Remo Sandron. 352 pp. L. 20.

**Methanol.** L. E. HAWLEY. U. S. 1,363,730, Dec. 28. The yield of MeOH obtained by destructive distn. of wood is improved by treating the wood with a small proportion of Na<sub>2</sub>CO<sub>3</sub> preliminary to the distn.

**Separation of the *m*- and *p*-cresols.** C. R. DOWNS and R. S. POTTER. U. S. 1,364,547, Jan. 4. A mixt. containing *m*- and *p*-cresols is treated with SO<sub>3</sub> to effect selective sulfonation and the product containing *m*-cresolsulfonic acid and *p*-cresol is subjected to distn. *in vacuo* with steam to distil *p*-cresol without decomposing the *m*-cresolsulfonic acid. The distn. is preferably conducted at a temp. of about 70°.

**Alcohol; ether.** A. A. L. J. DAMIENS, M. C. J. E. DE LOISY and O. J. G. PIETTE. Brit., 152,495, Sept. 16, 1919. Alc. or ether is produced by absorbing C<sub>2</sub>H<sub>4</sub> in H<sub>2</sub>SO<sub>4</sub> in the presence of a catalyst, and then distg. the resulting EtHSO<sub>4</sub> with H<sub>2</sub>O. The catalysts mentioned are the sulfates of Fe, Co, Ni, Ce, Mn, Cr, Mo, W, U, Cu, Pb, Hg, Au, V, Ti, and Sn, as well as P<sub>2</sub>O<sub>5</sub>, P<sub>2</sub>O<sub>3</sub>, SO<sub>3</sub> and As<sub>2</sub>O<sub>3</sub>. Industrial gases containing C<sub>2</sub>H<sub>4</sub>, e. g., illuminating gas or coke-oven gas, may be employed after removal of NH<sub>3</sub>, benzene, etc. The temp. of absorption is preferably fixed at 100-120°. The gases are passed through columns in which they meet a circulating stream of H<sub>2</sub>SO<sub>4</sub> containing the catalyst which has been satd. with C<sub>2</sub>H<sub>4</sub> in later columns. The gases then pass to columns where the C<sub>2</sub>H<sub>4</sub> is absorbed by fresh H<sub>2</sub>SO<sub>4</sub> mixed with catalyst. Each column is provided with a pump for maintaining a continuous counter-current circulation of acid, and the acid is preferably broken up into spray inside the columns. The acid from the latter columns may be withdrawn for diln. and distn., the acid remaining after distn. being then concd. by waste heat from the furnaces; or it may be passed backwards from column to column until it reaches the required diln., when it is filtered in a press and distd., the acid remaining being transferred if desired to the NH<sub>3</sub> absorption tower. The production of alc. or of ether from the distn. process depends upon the degree of diln. of the EtHSO<sub>4</sub>.

**Anthranol.** A. G. PERKIN. Brit. 151,707, June 26, 1919. Anthranol is prepd. by reducing anthraquinone with caustic alkali and a carbohydrate such as glucose, cane sugar, molasses, maltose, or lactose.

**Condensation products of naphthalene and its derivatives.** BAYER & Co. Ger. 301,713, Jan. 29, 1916. Naphthalene and its derivs. are condensed with aralkyl halides in the presence of small amts. of Fe or its compds.

## 11—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR. AND WILLIAM J. GIES

## A—GENERAL

FRANK P. UNDERHILL

**Occurrence of catalase in fish.** PER C. STOCKSTAD. *Tids. Kem.* 17, 181-7 (1920).—The fishes listed below showed positive tests for catalase. The order in which they are given is that of increasing activity. S. calls attention to the fact that the species with highest fat and esterase are at the bottom of the list. The fish are *Gadus merlangus*, *G. callarias*, *G. aeglefinus*, *Salmo trutta*, *Pleuronectes platessa*, *Hippoglossus vulg.*, *Sebastes marinus*, *Anarhicus sap.*, *G. virens*, *Clupea harengus*. Tests were made at  $pH$  7.07 and 15°. The optimum reaction const. was with 0.01 *N* and this was used in other expts. The increase in enzyme increased the const. With all fish samples except the herring the reaction was monomol. S. holds that the reaction in the herring was also monomol. but the final results were exceptional through the influence of some undetd. phenomenon. The reaction const. were detd. by  $KMnO_4$  titration before and after enzyme digestion:  $\{C = (1/t)\log[a/(a-x)]\}$ . For the first specimen in the list it came to 1.19 and for the last to 4.8.

A. R. ROSE

**Properties of oxynitrilase.** VERNON L. KRIEBLE AND WALTER A. WIRLAND. *J. Am. Chem. Soc.* 43, 164-75(1921).—The oxynitrilase was prepd. by shaking 10 g. of sun-dried peach leaves 3 hrs. with 240 cc.  $H_2O$ , filtering, adding 2.5 vols.  $Me_2CO$ , centrifuging 3 min. at 1500 r. p. m., washing with alc. and  $Et_2O$  and drying *in vacuo* over  $H_2SO_4$ . To study the rate of total nitrile formation the free HCN was detd. by Wirth's method, adding excess of standard  $AgNO_3$  containing  $HNO_3$  and titrating back with  $NH_4CNS$  and a  $Fe^{++}$  salt). To det. the amt. of optically active nitrile produced, the nitrile soln. is heated overnight at 65° with an equal vol. of concd.  $HCl$  and the optical activity of the resulting mandelic acid is measured. It was found that the enzyme does not have the same temp. coeff. as the spontaneous reaction between  $BzH$  and  $HCN$ , being more efficient at 0° while the spontaneous reaction is more efficient at 35°. In the spontaneous reaction equal amts. of *d*- and *l*-nitrile mols. are formed but under the influence of the enzyme only *d*-mols. are produced. As the reaction is reversible the enzyme will catalyze the dissociation of *d*-mols., but *l*- and *d*-mols. will be dissociated spontaneously in proportion to the amts. of each present. Consequently as the reverse reaction becomes more marked the optical activity gradually declines. This explains the observation of Rosenthaler (*C. A.* 7, 2585) that the optical activity of the nitrile rises to a max. and then falls to zero. The  $H$ -ion concn. has a very marked effect on the ratio of spontaneous to enzyme action; in neutral soln. practically all the  $BzH$  and  $HCN$  combine spontaneously and almost instantaneously and as the  $H$ -ion concn. increases the spontaneous reaction is repressed; at  $10^{-4}$  to  $10^{-6}$  the enzyme exhibits its max. activity.

CHAS. A. ROUILLER

**The nature of enzymes.** MAXIMILIAN HERZOG. *Monograph, Chicago* 1920, pp. 107.—This monograph, which contains the results of an incomplete series of investigations, was published from the notes of the author, compiled after his death, by the Chicago Municipal Tuberculosis Sanitarium. It consists of an investigation of the hypothesis that enzymes are living things, possessing the power of assimilation, metabolism, growth and reproduction; that they are, in fact, the real basis of life, which is due to the activities of these exceedingly small ferment granules. They constitute the elementary corpuscles postulated by biologists. The basic observation is that fresh saliva, added to antiseptic, synthetic, culture media and incubated, was found to exhibit a considerable rise in amylolytic power, together with an increase of coagulable protein *N* to several multiples of the original amts., which observations are interpreted as indicating a multiplication of the enzymes. After a time the amylolytic power and

protein content of the soln. fall, which is attributed to the existence in saliva of proteolytic enzymes which are themselves not proteins. Granules can be demonstrated in the incubated fluids by ultramicroscopic methods, which are believed to be the enzymes themselves. It was not possible to propagate the enzymes from generation to generation in artificial cultures. The nutrient fluid used contained 30–50% of glycerol, 2% phenol, 0.2% NaF,  $\text{NH}_4$  lactate and morphine sulfate as sources of N, and also NaCl,  $\text{MgSO}_4$ ,  $\text{CaCl}_2$ ,  $\text{H}_2\text{KPO}_4$ , K Sb tartrate. The author holds that each fermentation product, such as amylodextrin, erythrodextrin, achroödextrin, represents changes of generation occurring in the ptyalin granules engaged in splitting up the polysaccharide, starch. Each generation of granules possesses the power of assimilation, metabolism, nutrition, and growth; but only one generation possesses the power of reproduction, and that is the generation which is continually forming anew in the gland which furnishes the enzyme. This first generation does not, however, possess the characteristic fermentative power towards a definite substance (starch, proteins, etc.), and this generation of reproducing enzyme granules heretofore has been known as the zymogen stage of the enzyme. Heating even to  $80^\circ \text{C}$ . for 130 min. did not completely destroy ptyalin, since a trace was left which could form a little maltose in 11 days; 5 minutes heating at  $80^\circ$ , reduced the ptyalin activity but little. Propagation of ptyalin granules derived directly from salivary glands, is described. There are also considerations of the properties of ptyalin and its relation to malt diastase, the nature of toxins and the fallacies of the Ehrlich side-chain theory, and the adaptation of enzymes to changes in temp.

H. G. WELLS

**Biological and physical properties of the hemotoxin of streptococci.** PERCY D. MEADER AND GEORGE H. ROBINSON. Johns Hopkins Univ. *J. Exp. Med.* **32**, 639–50 (1920).—The hemotoxin of streptococcus is a labile substance affected by centrifugation or shaking. It is adsorbed by various org. and inorg. substances. Hemotoxin is produced within a wide range of H-ion concn. It is neither in nor on the bacterial cell but is free in the culture medium. It is probably not an enzyme. There are at least 2 substances which are essential to the medium for the elaboration of hemotoxin, one of which is P; the other is a substance of unknown compn. The latter is present in small quantities in unfiltered muscle infusion, but is more abundantly supplied by blood serum and kidney infusion. This substance is not an albumin, globulin, primary or secondary proteose, metaprotein, or peptone of the medium or enriching fluid. It is  $\text{H}_2\text{O}$  sol., is destroyed by boiling in alkaline soln., and by prolonged heating, and is removed to a considerable extent by passage through a diatomaceous filter.

C. J. WEST

KAHN, FRITZ: *Die Zelle*. 8th Ed. Stuttgart: Kosmos, Gesellschaft der Naturfreunde. Francksche Verlagsbuchhandlung. 68 pp. For review see *Osterr. Chem.-Ztg.* **23**, 155(1920).

MIEHE, H.: *Allgemeine Biologie, Einführung in die Hauptprobleme der anorganischen Natur*. 3rd Ed. revized. Leipzig: B. G. Teubner. 129 pp. For review see *Die Umschau* **24**, 666(1920).

#### B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**Estimation of glucose in blood by the method of Folin and Wu.** M. BORDS. *Bull. soc. pharm. Bordeaux* **58**, 214–25(1920).—Exptl. data are given to show that  $\text{NaPO}_3$  or picric acid may be used in place of  $\text{Na}_2\text{WO}_4$  for the removal of albumin from the blood previous to the colorimetric detn. of glucose according to the procedure of Folin and Wu. Metaphosphate method: Measure 1 cc. of blood or serum in a test-tube, add 8 cc. of a 0.6% aq. soln. of  $\text{NaPO}_3$ , shake, and add 1 cc. of  $\text{H}_2\text{SO}_4$  (1 in 20). Shake several times during 15 mins. and filter or centrifuge. Picric acid method: Measure 1 cc. of blood or serum in a test-tube, add 9 cc. of a satd. aq. soln. of picric acid, and 1 drop of a soln. of HOAc (1 in 2). Shake vigorously and filter or centrifuge.

Attention is directed to the fact that the glucose detn. should be made shortly after the specimen of blood is collected as a portion of the glucose is converted into lactic acid on standing.

A. G. DuMEZ

**Determination of chlorides in blood.** A. S. WETMORE. *Mass. Gen. Hosp. J. Biol. Chem.* 45, 113-8(1920).—The method depends upon the pptn. of the protein by  $\text{Cu}(\text{OH})_2$ , of the  $\text{C}_2\text{O}_4^{2-}$  and at least part of the  $\text{PO}_4^{3-}$  by  $\text{Ca}(\text{OH})_2$  and on the titration of excess  $\text{AgNO}_3$  with  $\text{KCNS}$ . (Cf. Harding and Mason, *C. A.* 11, 2475; and Rappleye, *C. A.* 12, 2586.) Into a 50 cc. volumetric flask, measure 2 cc. of plasma, 15 cc.  $\text{H}_2\text{O}$ , 4 cc. 1.5%  $\text{CuSO}_4$  soln. and 10 cc. 0.1 *N*  $\text{NaOH}$ , or, if whole blood is used, 2 cc. blood, 10 cc.  $\text{H}_2\text{O}$ , 8 cc.  $\text{CuSO}_4$  and 20 cc. 0.1 *N*  $\text{NaOH}$ . Heat in boiling  $\text{H}_2\text{O}$  bath for 1 min., rotating flask while heating. Cool, dil. to 50 cc., shake thoroughly and filter. To about 35 cc. of filtrate add 0.5 g.  $\text{Ca}(\text{OH})_2$ , shake a few times, let stand a min. and filter. To 25 cc. filtrate add 5 cc. of soln. containing 7.2653 g.  $\text{AgNO}_3$  and 150 cc. concd.  $\text{HNO}_3$  in 1000 cc., 2 cc. of 10% soln. of  $\text{Fe}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 24\text{H}_2\text{O}$ , stir until  $\text{AgCl}$  separates and titrate with  $\text{KCNS}$ , 1 cc. of which = 0.4 cc.  $\text{AgNO}_3$  = 1 mg.  $\text{NaCl}$ .

I. GREENWALD

**Gasometric determination of nitrogen and its application to the estimation of the non-protein nitrogen of blood.** R. L. STEHLE. *Marine Biol. Lab. and Univ. Penna. J. Biol. Chem.* 45, 223-8(1920).—To an aliquot or the whole of the Kjeldahl digestion mixt., add enough alk. to neutralize about  $\frac{2}{3}$  of the acid and transfer to Van Slyke apparatus for detg.  $\text{CO}_2$  in plasma. After evacuating to remove dissolved air, add enough alk. to complete neutralization of acid, then 1-2 cc.  $\text{NaBrO}$  soln. (made up of 1 vol. 28 g.  $\text{NaOH}$  in 100 cc., 1 vol. 12.5 g.  $\text{NaBr}$  and 12.5 g.  $\text{Br}_2$  in 100 cc. and 3 vols.  $\text{H}_2\text{O}$ ), evacuate, shake 1 min., and add 1 cc. of 5% pyrogallol in 28%  $\text{NaOH}$ . Allow to stand or cool in  $\text{H}_2\text{O}$ , bring vol. of gas to 1 cc. and read pressure required. Correct for *N* of blank and calculate as usual. Good results are claimed.

I. GREENWALD

**Evaporimeters and the movement of liquids across membranes.** PIERRE LESAGE. *Compt. rend.* 171, 927-30(1920).—A simple evaporimeter is described. Evapn. from the reservoir is prevented by a layer of oil. The membrane is a cloth impregnated with cellulose acetate. By varying the length and form of the connecting tube the pressure on the membrane can be regulated. The instrument is compact and can be weighed easily.

T. G. PHILLIPS

**Quantitative estimation of phosphatides.** D. H. BRAUNS AND JOHN A. MACLAUGHLIN. *J. Am. Chem. Soc.* 42, 2238-50(1920).—Animal or vegetable tissues which cannot be reduced to a powder or solns. in volatile liquids are dried with anhydrous  $\text{Na}_2\text{SO}_4$  +  $\text{CaSO}_4$  (Robertson, *C. A.* 10, 1650). Solns. of non-volatile liquids such as glycerol are boiled 1 hr. under a reflux with abs. alc., freed from the excess of alc. on the  $\text{H}_2\text{O}$  bath, treated with an equal vol. of satd.  $\text{NaCl}$  extd. with  $\text{Et}_2\text{O}$  and the  $\text{Et}_2\text{O}$  soln. evapd. in a weighed flask. Material which can easily be powdered is dried *in vacuo* at the lowest possible temp., extd. with abs. alc., the alc. ext. dried, mixed with  $\text{Na}_2\text{SO}_4$  +  $\text{CaSO}_4$  if necessary, extd. with anhydrous  $\text{Et}_2\text{O}$  and the concd. ext. washed with satd.  $\text{NaCl}$ . The impure  $\text{Et}_2\text{O}$ -sol. phosphatides, free from ext. P, thus obtained, are analyzed for P by decomp. the org. matter with  $\text{HNO}_3$ - $\text{H}_2\text{SO}_4$  pptg. with  $\text{NH}_4$  molybdate, reducing the ppt. with  $\text{SnCl}_2$  and comparing the resulting blue soln. in a colorimeter with a standard soln. Another portion of the phosphatides is analyzed for N by the Folin-Denis micro-Kjeldahl method and for amino N by the Van Slyke method. Finally still another portion is hydrolyzed by boiling 48 hrs. with 0.2 *N*  $\text{H}_2\text{SO}_4$  and the choline detd. as the chloroplatinate; this ppt. also carries down some aminoethyl alc. chloroplatinate for which correction is made by detg. the amino N; from this amino N plus that in the filtrate from the chloroplatinate is calcd. the amt. of cephalin. The method has been found satisfactory for the analysis of food and drug products.

CHAS. A. ROULLER

Albumin determination in urine by the Aufrecht and Esbach albuminometers. BRUNO WIENSS. *Pharm. Zentralhalle* 61, 535-7(1920).—The Aufrecht albuminometer gave a value of 107% and the Esbach with the pointed tube 125% and with the rounded tube 138%.

H. A. SHONLE

### C—BACTERIOLOGY

A. K. BALLS

Twenty-five years of bacteriology. S. FLEXNER. *Science* 52, 615-32(1920).—The address of the retiring president of the A. A. A. S. The paper reviews the advances made in bacteriology and especially preventive medicine for the last 25 yrs.

FRED W. TANNER

Bacteria as chemical reagents. A. I. KENDALL. *Chem. Met. Eng.* 24, 56-60 (1921).—A general discussion of the relation of bacterial changes to the industries in which it is shown that these microorganisms are of great beneficence. They force elements through their cycles, thus preventing the locking up of elements in complex and useless combinations. The complex substances in sewage are broken up to simpler ones which are available for plant synthesis. Bacteria require a great amt. of energy and since they possess no chlorophyll they must obtain this energy by decomp. and reducing complex materials.

FRED W. TANNER

Nutritional requirements of yeast. I. The role of vitamins in the growth of yeast. ELLIS I. FULMER, VICTOR E. NELSON AND F. F. SHERWOOD. *J. Am. Chem. Soc.* 43, 186-91(1921).—A study was made of the effect upon the growth of yeast in a basal medium (containing in 100 cc. 0.30 g.  $(\text{NH}_4)_2\text{SO}_4$ , 0.20 g.  $\text{KH}_2\text{PO}_4$ , 0.025 g.  $\text{MgSO}_4$  and 10 g. cane sugar) of various quantities of alfalfa and wheat embryo exts. (prepd. by extg. the substances 6 hrs. with hot c. p. anhydrous  $\text{Et}_2\text{O}$ , then 8 hrs. with hot alc. and evapg. the alc. exts. to dryness). Plotting the dry equiv. of ext. used against growth it is found that both exts. show optimum concns. but the optimum concn. of the alfalfa ext. (1.2 g. dry equiv. per 100 cc. medium) is far more potent than the wheat embryo ext. at its optimum concn. (0.06 g.). The wheat embryo curves up to the optimum have steeper slopes than the alfalfa curves and cross the latter at the concn. of 0.13 g. per 100 cc. The relative potencies of 2 materials can therefore not be detd. by comparison of the effects from exts. of equal wts. of dry materials. McCollum and Simmonds (*C. A.* 12, 711) have shown that water-soluble B is readily destroyed by dil. alkali; when the above exts. were heated 1 hr. with 5% NaOH under 7 kg. pressure, their properties as yeast stimulants were not injured. In two series of expts. the medium was composed of 10% sugar plus the optimum concn. of alfalfa ext. in one case and of wheat embryo ext. in the other; yeast has been growing in these media for 3 months, being transferred every day to fresh media. A medium (F) free from unknown constituents (see following abstr.) has been developed in which yeast has been growing satisfactorily for 10 months. It is concluded that water-soluble B is not a necessary constituent of a medium for the growth of yeast and that the alc. exts. of alfalfa and wheat embryo contain nitrogenous and org. materials which will maintain the growth of yeast. II. Effect of the composition of the medium on the growth of yeast. *Ibid* 191-9.—With a medium containing 0.100 g.  $\text{K}_2\text{HPO}_4$ , 0.100 g.  $\text{NH}_4\text{Cl}$ , 0.0 g.  $\text{CaCl}_2$ , 0.100 g.  $\text{MgSO}_4$ , 0.020 g.  $\text{CaCO}_3$  and 10 g. saccharose in 100 cc. as basal the effect of varying one constituent at a time was studied. As a result it has been found that the following is the most satisfactory medium (referred to as F in the preceding abstr.) for growing yeast at 30°: 0.188 g.  $\text{NH}_4\text{Cl}$ , 0.100 g.  $\text{CaCl}_2$ , 0.100 g.  $\text{K}_2\text{HPO}_4$ , 0.040 g. pptd.  $\text{CaCO}_3$ , 0.80 g. dextrin, 10 g. sugar. The optimum concn. of several  $\text{NH}_4$  salts (sulfate, nitrate, tartrate) was found to be identical with that for  $\text{NH}_4\text{Cl}$  which is that in which a protein (wheat gluten) is least swollen and which varies with the temp. Asparagine does not improve the medium.

CHAS. A. ROÜLLER

Effect of zinc and iron compared with that of uranium and cobalt on growth of *Aspergillus*. R. A. STEINBERG. *Bot. Gaz.* 70, 465-8(1920).—This is a confirmation of the work of Raulin (*Ann. sci. nat. bot.* V. 11, 93(1889)) and Javillier (La présence et la rôle du zinc chez la plantes. Thèse. Paris 1908) that iron and zinc are essential for the growth of *Aspergillus niger*. "The assumption must be made that when iron and zinc are present in favorable amounts a partial replacement of either or both these elements can occur by the so-called 'chemical stimulants.' " BENJAMIN HARROW

## D—BOTANY

C. L. ALSBERG

Studies and investigations of the biochemistry of tobacco. III. The metabolism of nitrogen in the development of the tobacco leaf. G. PARIS. *Slaz. sper. agrar. ital.* 53, 81-96(1920).—An idea of the compn. of tobacco leaves is given in a previous paper (*Boll. tech. colt. tabac.* 13, 351(1914)) in which the constitution of the reserve carbohydrates, the pectic substances, hemicelluloses, tannin and the nitrogenous substances contained in the leaves were studied. A second paper (*C. A.* 11, 2598) contains a critical examn. of the methods for the detn. of the nitrogenous substances in tobacco leaves. A third paper dealt with tobacco seed considered not only from the technical viewpoint with reference to the oil and the high proportions of nitrogenous substances contained but also with regard to the constitution of the fatty and nitrogenous substances (*Boll. tech. colt. tabac.* 13, 288(1914); *Rend. soc. chim. ital.* 1914, 233). P. has already shown that tobacco seedlings developing at the expense of the reserve materials stored in the seed manuf. nicotine under the influence of light from the products of the hydrolysis of the reserve nitrogenous substances (*Boll. tech. colt. tabac.* 17, 1(1920)). Lotsy (*Czapek's Biochem. der Pflanzen* II, 269 (1905)) has shown that cinchonine can be formed directly from  $\text{NH}_3$  by floating leaves of the Cinchonaceae upon a 0.25% soln. of  $\text{NH}_4\text{Cl}$ . Similar tests with tobacco leaves show that nicotine is also formed in this manner. The leaves were cut in half along the principal vein, the moisture and nicotine detd. in one half and the other half floated in diffuse light upon a 0.25%  $\text{NH}_4\text{Cl}$  soln. The nicotine increased from 1.88% and 1.54% to 2.22% and 2.01% resp., in the dry basis. Tobacco plants were grown in the field under normal conditions of development and the compus. of topped and non-topped plants detd. It was shown as the result of many repeated expts. that the leaves of the non-topped plants always contain amino compds. besides nicotine, while those of the topped plants which were loaded with nicotine contained very little of these compds. Besides certain differences in the external character of the leaves caused by topping a quant. modification of their chem. constitution resulted as shown in the table:

	% Total N.		% Nicotine N.		% Protein N.		% Amino N.	
	Non-topped.	Topped.	N-T.	T.	N-T.	T.	N-T.	T.
Aug. 15.....	4.07	4.15	0.32	0.63	0.15	0.16	0.35	0.08
Aug. 25.....	4.43	4.30	0.32	0.70	0.29	0.23	0.30	0.10
Sept. 10.....	4.20	4.32	0.34	0.83	0.36	0.32	0.38	0.10
Sept. 20.....	4.30	4.15	0.39	0.85	....	0.26	....	0.09
Sept. 30.....	4.50	4.69	0.44	0.83	0.30	0.39	0.53	0.08

The above percentages are on the dry basis. The total N was detd. directly on the leaves, the other forms on aq. infusions. Analysis of all the leaves from a topped and a non-topped plant, resp., gave the following on the dry basis: Total N, 4.49, 4.62; nicotine, 1.48, 6.65; nicotine N, 0.26, 1.15. In the infusion: Total N, 1.90, 1.72; basic N, 0.39, 1.09; protein N, 0.35, 0.42; amino N, 0.86, 0.10; residual N, 0.30, 0.11. The deductions made from the data obtained are: (a) Nicotine diminishes in quantity from the base towards the apex of normally developed plants. It finally ceases to be determinable though substances precipitable by phosphotungstic acid exist in the flower stem. Microchem. tests have shown nicotine present in the lacunose tissue of the

placenta in the external integument of the ovules and in the cells that surround the embryonal sac; with maturation of the seed every trace of nicotine disappears from the endosperm and the seed no longer contains any. In the same plants the total N increases from the base towards the top and similarly amino N. In topped plants nicotine is relatively abundant in all parts of the plant without the quantity in the leaves presenting any notable difference from the rest of the plant. (b) The sol. N compds. in the leaves of the topped plants is almost exclusively that of proteic and basic substances while that of the non-topped plants is that of amino compds. Sol. proteic N is in general greater in the topped plants. Topping brings about an increase in nicotine and a decided decrease of amino substances. (c) Contrary to G. Albo (*Contribution alla biologia vegetale*, 3, fasc. I. Palermo 1901) from the recorded facts it cannot be maintained that the nicotine migrates from the leaves and stem to give rise in the seed to reserve nitrogenous compds. It is not a question of diminution of nicotine in the leaves and stem but of its non-formation. The nicotine should be considered a condensation product whose formation is to a certain extent dependent upon amino compds. It is formed in the presence of light in the chlorophyll-containing organs. The N which migrates to the seed to be accumulated as reserve N is chiefly amino N. (d) Explanation of the relation between nicotine and the amino compds. is difficult since it is impossible to state whether the nicotine is formed directly from the amino compds. or whether it is formed from those substances which otherwise would give rise to asparagine or to analogous compds. The importance of the different quant. relation between the amino N and the basic N found in the leaves of the topped plants and in those of the non-topped plants cannot be overlooked. This fact established we are not in position to decide whether the amino compds., being wanting where the accumulation of nicotine is greatest, are directly used for the formation of the alkaloid or whether those substances are used by hydrolysis of which the amino compds. are formed. The deficiency of amino N met with in the leaves of the topped plants cannot be attributed to greater accumulation of proteic N because such accumulation cannot always be verified and where verified it is extremely small compared with the increase in basic N.

ALBERT R. MERZ

**Growth of the cotton fiber.** DANIEL E. DOUTY. *Textile World J.* 57, 1303(1920). —Photomicrographs of cotton in various stages of its development within the cotton boll are given.

CHAS. E. MULLIN

**Minor contributions to plant chemistry.** EDMUND O. VON LIPPMANN. *Ber.* 53, 2069-77(1920).—(1) *Malonic acid as a product of fermentation.* A large vat of "sweet water" to which lime water had been added underwent rapid fermentation. A solid white layer of various organisms formed. On fragments of filter cloth accidentally included in the scum crystals of Ca malonate sepd. Ca malate was found in the sediment. (2) *An occurrence of chelidonic acid.* This acid, 1,4-pyrone-2,6-dicarboxylic acid, was isolated from the ammoniacal Pb acetate ppt. from the ext. of the young leaves of *Gloriosa superba*, one of the Liliaceae. (3) *An occurrence of coumarin.* With the aid of emulsin, coumarin was isolated from the press juice from *Melilotus arvensis* (?). It is probably present in the form of a glucoside. (4) *Sorban, a gum yielding sorbose.* This gum formed in a large wound in a mountain ash tree. The fresh gum was sol. in H<sub>2</sub>O, but on standing soon became insol. Acids caused rapid decompn. so this method of hydrolysis could not be used. Fresh sap of the leaves and of the twigs of the tree were without effect, but when combined they hydrolyzed the gum rapidly. Sorbose was isolated from the products of hydrolysis. (5) *An occurrence of melibiose.* This sugar was isolated from a thick clear sirup which exuded from the broken ends of stalks of the yellow mallow that were in bloom. No raffinose was found in other samples of the mallow.

T. G. PHILLIPS

The gassing of plants with carbon dioxide. E. REINAU. *Chem.-Zig.* **44**, 808 (1920).—A criticism of Claassen (cf. *C. A.* **14**, 3745). T. G. PHILLIPS

The gassing of plants with carbon dioxide. F. BORNEMANN. *Chem.-Zig.* **44**, 808 (1920).—A reply to Claassen's criticism (cf. *C. A.* **14**, 3745). T. G. PHILLIPS

The gassing of plants with carbon dioxide. H. CLAASSEN. *Chem.-Zig.* **44**, 808 (1920).—A reply to Bornemann (cf. preceding abstract). T. G. PHILLIPS

Photosynthesis in the Florideae. RENÉ WURMSER AND J. DUCLAUX. *Compt. rend.* **171**, 1231-3 (1920).—Green fronds grow near the surface, red ones at a greater depth. The latter show much greater photosynthetic activity, and contain much more chlorophyll than the former. Both contain practically the same amt. of lipochromes (carotin and xanthophyll). T. G. PHILLIPS

The chemical examination of *Macrozamia spiralis*. JAMES M. PETRIE. Univ. Sydney. *Proc. Linnean Soc. New S. Wales* **45**, 424-42 (1920).—The leaves and nuts of this cycad are often eaten by stock with fatal results. Formic, acetic, valeric, lauric, oleic, stearic and higher fatty acids, phytosterol, a hydrocarbon probably  $C_{30}H_{62}$ , and an olefin were isolated from the alc. ext. of the leaves. No poisonous substance was found. Feeding expts. with rats also failed to show the presence of toxic substances. Feeding the fresh nuts alone caused death by impaction within 3 days. T. G. PHILLIPS

Cyanogenesis in plants. IV. The hydrocyanic acid of *Heterodendron*, a fodder plant of New South Wales. JAMES M. PETRIE. Univ. Sydney. *Proc. Linnean Soc. New S. Wales* **45**, 447-59 (1920).—The foliage of *Heterodendron oleacefolia*, an evergreen tree, is much used for cattle feeding during the drought. It contains a cyanogenetic glucoside yielding HCN equal to 0.328% of the dry wt. of the leaf. Autolysis, or hydrolysis with acids failed to liberate all the HCN. Digestion with emulsin caused complete decomn. of the glucoside. T. G. PHILLIPS

The anthocyanins of *Beta vulgaris* L. and *Raphanus sativus* L. GUSTAV SCHUDEL. Doctorate Dissertation, Eidgenössischen Techn. Hochschule. Zürich 1918, 1-64. —The first part consists of a brief summary of the history of the prepn. of anthocyanins, while the theoretical part deals largely with the constitutional formulas of various anthocyanins. S. has tabulated the solubilities of types of diglucosides, monoglucosides and anthocyanidins which were represented by picrates of cyanin, chrysanthemin and cyanidin, resp., in many org. solvents. The solubilities of 12 picrates of anthocyanins in ether, ethyl amyl ether, diamyl ether, diethyl ketone, carvone and amyl alc. are recorded in another table. The tabulations of solubilities make it possible to find a means for quickly sepg. diglucosides, monoglucosides and anthocyanidins in the same soln.; it is further made possible to isolate each of these substances free of the others. A method for the quant. sepn. and the detection of diglucosides, monoglucosides and anthocyanidins is fully outlined. By shaking an anthocyanin in the form of its picrate (chloro- or dichloro-) with an aq. soln. and certain org. solvents the author has devised a method of prepng. these color stuffs pure. The prepn. of the required chloro- and dichloro-picric acid is described. In order to obtain the color stuff (*betanin*) of red beets, the beets were first cut into thin slices and then dried in a drying app. as quickly as possible. The slices were ground in a mill. A mixt. of 6% concd. HCl and 94%  $CH_3OH$  was used for the extrn. One kg. of the beet powder was then shaken for 2.5 hrs. with this soln., filtered and finally washed 3 times with 1.5 l. of the mixt. The filtrate was pptd. with 12 l. of ether, after an hour the sirupy ppt. was sepd. by decantation, washed twice by triturating with acetone and then 2-3 times with dry ether, then worked with chloropicric or dichloropicric acid; only the method with dichloropicric acid will be described in this abstract. Agitate the crude prepn. from 1 kg. beet meal, after washing with acetone and ether, with 500 cc. of satd. dichloropicric acid soln. (35 g. acid). A granular cryst. ppt. forms, consisting of the picrate of the color stuff,



etc. This sepn. here is of no object for a purer product is obtained by extrn. as follows: Add a soln. of  $\text{NH}_4$  dichloropicate (made by adding  $\text{NH}_4$  to a satd. picric acid soln.) and shake the whole with 500 cc. of acetophenone-amyl alcohol (1:2) containing 10 g. of dichloropieic acid. For the 2nd extrn. in which 300 cc. of solvent (containing 7 g. of acid is used, one adds 100 cc. of  $\text{NH}_4$  picrate to the mother liquor and 17 g. of the free acid is dissolved in 200 cc. of warm water. For obtaining the pigment from the amyl alc. see the original paper. Yield equals 2.2 g. pigment from 1 kg. beet meal. By colorimetric methods one could ascertain that beet meal contains about 10 g. pigment per kg. This estn. is only approx. for the beet contains both yellow and red pigments. The product won by extrn. is 92-94% pure. The crystn. of *betanin* is wasteful but with rapid work much loss is prevented. Place 1 g. of the powder, with acetophenone, in a test tube with 8 cc. of 0.01%  $\text{HCl}$ , stir with a thermometer and in 1-1.5 min. raise the temp. to  $75^\circ$ . Pour the hot soln. quickly through a double filter cloth into a crystg. dish and allow to stand 5-6 hrs. in an ice chest. A part of the pigment seps. as 6-8-sided crystals. Filter on a double filter cloth. In a dry state the powder is bronze-green and shiny. The yield is 0.3-0.32 g. of the crystd. color stuff. The ash content has fallen to about 1-0.4%. In the second crystn. (0.8 g. pigment in 16 cc. of 0.01%  $\text{HCl}$ ) the *betanin* is obtained nearly ash-free. The yield from the 2nd crystn. was about 50% of the color stuff used the first time. From the mother liquor about  $\frac{1}{3}$  of the material can be obtained in the amorphous state. *Betanin* crystallizes from 0.01%  $\text{HCl}$  with water of crystn., a part of which is given up at  $105^\circ$  under high vacuum; water is also taken up in crystg. from  $\text{EtOH-HCl}$  soln. and  $\text{HCl}$  containing ether. The former crystals are poorer in chlorine than the latter yet neither lose any chlorine on drying in the vacuum at  $105^\circ$ . Solubilities in water,  $\text{EtOH}$  and  $\text{MeOH}$  are recorded. The relation of *betanin* to aq.  $\text{AmOH-HCl}$  showed it to be a glucoside; also glucose was split off the *betanin*. An analysis gave 55.16% C, 4.96% H and 8.57% of N. The sugar-free deriv. *betanidin* on account of its instability was obtained only in the ethylated condition. It was analyzed and found to contain 60.24% C, 5.27% H and it also gave a qual. test for N. The above described *ethylated betanidin* is violet-red, its color in alc. is blue-violet; the  $\text{HCl}$  alc. acid soln. is less red than the abs. alc. soln. It is easily sol. in alc.  $\text{EtOH}$ ,  $\text{MeOH}$  and  $\text{HCl-EtOH}$ , in water and weak acid it is moderately sol. The water soln. is unstable as is also the acid soln. In abs. alc. the substance is more stable and in  $\text{HCl}$  abs. alc. protected from water, it is stable. On long standing the solns. become colorless. Alkali disturbs the color at once and a yellow soln. results. If bicarbonate is added to a water soln. it becomes darker and the color quickly disappears. Spring water produces with it an indigo blue, which at once changes. Its picrate is difficultly sol. It forms dark violet aggregates, from which, under the microscope, jagged bodies are seen to project. Lead acetate forms with it a fine lead salt ppt., which at first is blue and then takes on a darker tint. Other properties are recorded. Two types of radishes were used of which one possessed a yellowish red pigment while the other had a red pigment. The radishes were peeled and the outer layer only used for pigment extrn. About 50 g. of the peelings were soaked in 50 g.  $\text{AcOH}$  and then extrd. in 30 min. The intensively yellowish red soln. was filtered and then was pptd. with 1.5 times its vol. of ether. Twenty-three kg. of radishes produced 2.7 kg. of peelings. The first ether pptn. produced 17.3 g. of crude acetate. 4.6 g. of this crude acetate was treated with 200 cc. of water which contained 3 g. of chloropieic acid; shake and place in ice box overnight. The next day filter through tale and shake out the picrate twice with 60 cc. of acetophenone-amyl alcohol (1:2). Before the second extrn. sat. the mother liquor anew with chloropieicrin. Mix the filtered ext. with 60 cc. of alc. which contains 1% of  $\text{HCl}$  and then ppt. with 10 vols. of ether. Yield is 0.4 g. of the pigment as a chloride which is 100% pure. Analysis gave 52.49% C, 5.28% of H and 5.63% Cl. The powder was shiny vermillion. It dissolves in dil.  $\text{HCl}$  giving a

yellow-red soln. The pigment (*raphanin*) is very easily sol. in  $\text{CH}_3\text{OH}$ , and in water. Abs. alcohol which contains 1-7% of HCl dissolves it difficultly in the cold; in a warm soln. it is sol. The color in  $\text{EtOH-HCl}$  is only slightly red as is also its aq. soln. The aq. and alc. solns. lose their color on standing, due to isomerization; this change takes place more rapidly when warm. When the soln. is acidified the red color comes back. *Raphanin* shows no fluorescence in aq. HCl and only weakly in alc. *Raphanin* hydrolyzes in (5-7%) HCl soln. at room temp. With lead acetate an aq. soln. forms a cornflower-blue ppt.; with  $\text{NaHCO}_3$  the acid soln. forms a red-violet ppt. similar to the color of beets in  $\text{CH}_3\text{OH-HCl}$  soln. An alkali soln. produces a blue-violet color.  $\text{FeCl}_3$  gives no characteristic reaction and produces only a darker brown tint. Hydrolysis of *raphanin* showed it to be a diglucoside. The anthocyanidin (*raphanidin*) was found to be identical with pelargonidin. Pigment was extd. from the dark violet species of radishes in much the same manner as described above for the one which possessed the yellowish red pigment. The pigment (*rubin*) is a dark carmine-red powder, which dissolves in dil. HCl and appears oily. In cold  $\text{EtOH}$  (1-4% HCl) it is difficultly sol. but in  $\text{CH}_3\text{OH}$  very easily. In abs. alc. it dissolves quite difficultly. With picric acid it forms crystals; 0.5 g. of the chloride dissolved in 6 cc. of 0.01% HCl is mixed with 2 vols. of hot satd. picric acid. The dil. HCl soln. of rubin is red in color. Rubin in alc. soln. possesses the properties of a blue dye. In water and alc. isomerization takes place. On addition of acid the color returns. When bicarbonate is added to a HCl soln. a violet color results; with alkali the color changes from violet to blue. Lead acetate produces blue ppt. Hydrolysis showed it to be a diglucoside. *Rubidin*, the anthocyanidin of rubin was found to be identical with cyanidin. F. M. SCHERTZ

**Composition of normal and mottled citrus leaves.** W. P. KELLEY AND A. B. CUMMINS. *J. Agr. Research* 20, 161-91(1920).—It was shown that an orange leaf normally contains the max. amt. of K, P and N by the time it is approx. 6 weeks old, which is the time it reaches max. size; the abs. content of Ca continues to increase until full maturity is reached. When the leaf is mature the dry matter contains 5 to 6% of Ca. Before the time of normal dropping of leaves, K and N and a part of the P are translocated back into the stem but Mg does not decrease as maturity is approached. The compn. of mottled citrus leaves differs widely from normal ones. The Ca content is smaller and K and P greater in the mottled leaves. The N content is usually abnormally high. The sap of normal orange leaves becomes increasingly concd. and acidic as growth proceeds. When mature it is rich in Ca and contains twice as much as it does K. The sap of mottled leaves is also abnormal. It is lower in Ca, and contains twice as much K and P as mature normal leaves. The H-ion concn. is approx. the same in both. The spurs, roots and rootlets of the mottled-leaf tree differ in chem. compn. from the normal tree as does the sap and leaves. The results show that mottled leaves are deficient in Ca, but the cause of this deficiency is not known. J. J. SKINNER

**Injury to seed wheat resulting from drying after disinfection with formaldehyde.** ANNIE M. HURD. *J. Agr. Research* 20, 209-44(1920).—Wheat treated with solns. of 0.1 and 0.2%  $\text{HCHO}$  received no injury if seed were germinated immediately after treating. If the seed are allowed to dry without aeration and held several days before planting severe injury resulted. The injury is apparently due to a deposit of paraformaldehyde on the seed, which forms as the  $\text{HCHO}$  evaps. The solid paraformaldehyde is constantly breaking down into  $\text{HCHO}$  gas. The degree of injury from  $\text{HCHO}$  depends primarily on the atm. humidity during the storage period. The treated seed can be kept indefinitely in an atm. damper than 70% humidity. In an atm. of 70% and less there is decided injury. The sorghums, brown durra, honey sorgo and Sudan grass are uninjured upon being stored dry after treatment with a 0.2% soln. of  $\text{HCHO}$ . If seeds are washed with water immediately after treatment and stored dry no injury results. J. J. SKINNER

**Physiology of the apple. Distribution of food materials in the tree at different periods of vegetation.** O. R. BUTLER, T. O. SMITH AND B. E. CURRY. New Hampshire Agr. Expt. Sta., *Tech. Bull.* 13, 21 pp.(1920).—The trees used in the study were from a 7-year-old orchard on sandy soil near Exeter, N. H., of the Golden Ball variety. Two trees were taken for analysis, the analyses being separately made in each case. Samples for analysis were collected (1) during dormancy; (2) at the awakening of vegetation; (3) when in bloom; (4) as soon as active growth ceased, and (5) at leaf fall. During the dormant period the roots contain more starch than the trunk and limbs, the limbs contain least, but during the budding season the branches contain most. During the 4th period the trunk contains relatively more starch than the roots or branches, and at the 5th the roots again contain more. Sucrose is present in all parts of the tree at all times. During dormancy it is most abundant in the small roots; then follow in decreasing order, 1-year-old branches, then 3-, 4-, 2- and 5-year-old branches. At the budding period the 1-year-old branches are relatively much richer, while the roots have lost heavily, the older branches are slightly poorer. At blossoming time and at the close of growth the roots are richer. The changes in sucrose content of the different parts of the tree are very largely independent of the starch. It is concluded that sucrose is primarily a reserve food material and not simply an intermediate stage in starch hydrolysis. At the beginning of vegetation reducing sugar is formed, at the expense of sucrose, the hydrolysis being more marked in the small roots. The reducing sugars accumulated in the small roots are translocated to the growing parts prior to blossoming, when they are utilized in tissue formation. Reducing sugar appears to be the main migration form of the carbohydrates. Fats are always present in the apple and apparently function as reserve food material since they disappear from the roots during the early stages of growth and accumulate in the 1- and 2-year-old branches. The N reserve materials are stored mainly in the younger branches from which they pass to the actively growing regions upon the awakening of vegetation. The P required in building new tissues at the awakening of vegetation is mainly obtained from the younger branches, while the translocation of K occurs mainly from older parts than those that supply the needed P and N.

J. J. SKINNER

**Japanese corydalis bulb.** Y. ASAHINA AND NAOTI FUJITA. *J. Pharm. Soc. Japan* 1920, 463, 763-6.—A botanical paper. Japanese corydalis bulb is from *Corydalis decumbens* Pers. and not *Corydalis vernyi* as reported by Makoshi who investigated the chem. compn. of alkaloids of Japanese corydalis bulb (cf. *C. A.* 3, 572). Microscopical and morphological figures are given to illustrate the difference between Japanese and Chinese corydalis bulbs.

S. T.

Carbohydrates of the pecan (FRIEDEMANN) 12.

## E—NUTRITION

PHILIP B. HAWK

NORMAL

**Alcohol as a food.** I. ATHANASIU. Faculté des Sci., Bucarest. *Rev. gén. sci.* 31, 714-8(1920); cf. *C. A.* 14, 3468.—A review of the literature with excellent bibliography on the value of alc. in nutrition under the following heads: Influence on gastric secretion and enzyme action; stimulation of the nervous system; increase in muscular activity; dynamogenetic value; therapeutic use. All claims for alc. as a food or as a therapeutic agent are held to be invalid in the light of recent scientific evidence.

H. B. LEWIS

**Effect of high-fat diet upon the growth of lymphoid tissue.** EUGENE L. SETTLES. *Anat. Rec.* 20, 61-93(1920).—Kittens of the same litter were fed on diets differing only in their fat content (the caloric values differed) and the effect upon the development of lymphoid tissue was noted. The fat percentages (milk fat) were 3.5 and 6. After 4.5 mos. of feeding the cat on the high-fat diet weighed 510 g. more and was about 30%

larger than the one on low-fat diet. In the former the pancreas and liver were larger, the thymus was 85.8% heavier, and the mesenteric lymph gland weighed 52.7% more. Heart and kidneys were only about 25% larger.

G. H. SMITH

**Feeding studies on infants.** B. SCHICK. *Z. Kinderheilk.* 27, 57-78(1920).—The addition of sugar to mother's milk (17 g. beet sugar to 100 g. milk) doubled its food value.

G. H. SMITH

**The vitamine Question.** E. P. HÄUSSLER. *Schweiz. Apoth.-Ztg.* 58, 621-6, 634-40, 655-8(1920).—A review is given of the history of vitamins and of the theories as to their chem. nature. Tschirch's theory of the biol. function of vitamins (*Schweiz. Med. Wochschr.* No. 2, 21,(1920)) in building up the animal organism, is as follows: The organism cannot, unaided, synthesize from aliphatic amino acids such cyclic compds. as, e. g., purine and pyrimidine bases, which are so essential in the formation of nucleic acids, or cellular nuclei. The synthesis, however, takes place in presence of enzyme-like substances, "*Cycloelases*," i. e., "ring closers," which contain, or perhaps are identical with the vitamins themselves.

S. WALDBOTT

**Fermented milk and milk diets in controlling intestinal putrefaction.** R. C. FISHER. *Creamery and Milk Plant Co.* 9, No. 12, 31-3(1920).—To study the effect of various milk diets on the intestinal flora and the amts. of decompn. products produced six individuals were placed on certain milk diets for 28 days. The diets included (a) milk inoculated with *B. bulgaricus*, *B. lacticus* and *B. acidophilus*; (b) normal whole milk of grade A quality; (c) aqueous suspensions of *B. acidophilus*, *B. bulgaricus* and *B. bifidus*. Observations were made on the nature of the intestinal flora and the production of phenol, indole, skatole and indican in the feces and urine. H. F. ZOLLER

#### ABNORMAL

**A study of the relation of family income and other economic factors to pellagra incidence in seven cotton-mill villages of South Carolina in 1916.** JOSEPH GOLDBERGER, G. A. WHEELER AND EDGAR SYDENSTRICKER. *Public Health Reports* 35, 2673-2714(1920).—This is a continuation of the work of the authors on pellagra incidence in certain cotton-mill communities (cf. *C. A.* 14, 2018). In general there is an inverse proportion between pellagra incidence and the family income. The latter det., in part, the character of the diet, as well as conditions of hygiene and sanitation. Differences in incidence among households in the same income class may be attributed to differences (a) in "amt. of income available for food purchase," (b) in intelligence and ability in utilizing efficiently the available income, and (c) in availability of food from other sources, e. g., home-owned cows, poultry, and gardens. Individual eccentricities in diet are also a factor. In economically similar villages differences in pellagra incidence may be due to variations (a) in the character of local markets, (b) in produce from adjacent territory, and (c) in marketing conditions. The authors urge an improvement of food availability, esp. milk and fresh meat, in such localities.

A. L. BARKER

**Epidemic of scurvy among children.** HARRIETTE CHICK AND ELSIE J. DALVELL. *Z. Kinderheilk.* 26, 257-69(1920).—Forty cases of scurvy developed among 64 children who were inmates of the tuberculosis division of the Children's Clinic in Vienna. The epidemic is ascribed to the method of food prepn., since although antiscorbutic foodstuffs were an important factor in the dietary, they were subjected to such prolonged cooking that the antiscorbutic properties were destroyed.

G. H. SMITH

**Vitaminosis and inanition.** AUGUSTE LUMIÈRE. *Bull. acad. med.* 84, 274-6(1920).—Avitaminosis is only a particular type of inanition.

G. H. SMITH

#### F—PHYSIOLOGY

ANDREW HUNTER

**Action of the bile on the excitability of the spinal reflex centers.** ALESSANDRO ROSSI. *Univ. Padova. Arch. sci. med.* 43, 156-66(1920); cf. *C. A.* 14, 2944.—In a frog bile caused a more rapid diminution than in a control treated with normal saline,

the amt. of reduction being proportional to the amt. of bile. An effect is produced by amts. of bile insufficient to affect the motor nerves or the muscle (gastrocnemius) itself.

M. HEIDELBERGER

**Hemolysis by hypertonic saline solutions.** Preliminary note. HENRI FREDERICQ. *Bull. acad. roy. méd. Belg.* 30, 795-805(1920).—Hemolysis by solns. of NaCl of 1-10% is not instantaneous, requiring several days for completion, and occurring more rapidly and completely in the more concd. solns., somewhat more slowly on lowering the temp. to 5°. A progressive diminution in the no. of corpuscles occurs, some being more resistant than others. If those resisting hemolysis in a strong NaCl soln. are transferred to normal saline, hemolysis occurs.

M. HEIDELBERGER

**Parallelism between the peripheral and pulmonary vasomotor reactions.** AZZO AZZI. Univ. Napoli. *Sperimentale* 74, 25-34(1920); cf. *C. A.* 14, 1851.—A peripheral vasoconstriction caused by emotional (Claxon horn) or thermic (diminution of temp.) stimuli results in a reduction in the temp. of the expired air, thus confirming Galeotti's hypothesis.

M. HEIDELBERGER

**Phagocytosis. X. Influence of various fixing agents of bacterial protoplasm.** GEORGIO PARRINO. Univ. Palermo. *Sperimentale* 74, 76-81(1920).—24 hr. agar typhoid cultures were treated with 10% formalin (A), 95% alc. (B), 1% H<sub>2</sub>CrO<sub>4</sub> (C), 1% HgCl<sub>2</sub> (D), D followed by Lugol's soln. (E), and osmic acid (F) for 2 hrs. Phagocytosis was below normal in the case of A, B, and D, and above normal with C, E, and F. In the case of E it is considered that the I removes the Hg from its protein combination, thus leaving the oxidizing effect of D to produce an effect on phagocytosis like that of C and F. **XI. Modification by fatigue.** GENNARÒ DI MACCO. Univ. Palermo. *Ibid* 82-92.—In the guinea pig acute fatigue gives rise to substances in the blood which depress phagocytosis by as much as 25%, the value gradually returning to normal during several days.

M. HEIDELBERGER

**Dental incrustations and the so-called "gold-plating" of sheep's teeth.** THOS. STEEL. *Proc. Linnean Soc. New S. Wales* 45, 324-8(1920).—Analyses of the dental incrustations from man and several of the larger animals are given. Comparatively slight variations were found.

T. G. PHILLIPS

## G—PATHOLOGY

H. GIDEON WELLS

**Diminution of chlorides in acetonuria.** R. GUYOT. *Bull. soc. pharm. Bordeaux* 58, 235-242(1920).—G. has examd. the urines in cases of acetonuria due to dyspepsia and finds that the chloride content is always low (as low as 0.9 g. per l.). The diminution in the amt. of chlorides present begins with the appearance of acetonuria and the amt. again becomes normal as the acetonuria subsides. This retention of chlorides is attributed to an effort on the part of the organism to maintain the isotonicity of the blood or lymph.

A. G. DuMEZ

**Studies of group hemagglutination in man.** O. WESZECZYK. *Biochem. Z.* 107, 159-71(1920).—Rabbits, hens, guinea pigs and steers do not exhibit isoagglutinating phenomena. Dogs may or may not do so and horses probably are active while swine are definitely so. The expts. on man showed that there are different groups that differ in their isoagglutinating powers, and no relation can be found between this property and habitus, disease or nationality. Studies of human families detd. that neither direct, crossed nor alternation transmission exists. The importance of this group similarity is evident when the necessity of blood transfusion is under consideration. F. S. HAMMETT

**Influence of the thyroid on the leucocytic formula in Basedow's disease.** GINO BAGGIO. Univ. Rome. *Arch. sci. med.* 43, 93-127(1920).—The thymus, as well as the thyroid, contributes to the maintenance of the lymphocytosis. M. H.

**Resistivity of blood serum.** HERMAN. *Bull. acad. roy. méd. Belg.* 30, 912-3(1920).—Using the same procedure as for measuring  $\rho$  of the urine (*C. A.* 14, 3105), the

av.  $\rho$  at 15° was found to be 104.2 ohms, with 92 and 114.2 as the extremes of 102 samples of human serum. 51 of 54 contained between 5 and 6 g. NaCl (per l. ?). Variations are thus less than for urine, but here also the resistivity curve is not parallel with the curve of NaCl, indicating that here, also, other substances influence  $\rho$ . Taking  $\rho'$  as the resistivity of NaCl soln. of equiv. content,  $\rho/\rho' = 0.86$ , while that for urine is 0.87.  $\rho$  was not influenced by a positive Bordet-Wassermann reaction, or by albuminuria, measles, or scarlatina, while it may show an increase in *uremia* and *typhoid*, particularly during convalescence.

M. HEIDELBERGER

**Bence-Jones albuminuria.** IDE. *Bull. acad. roy. méd. Belg.* 30, 914-24(1920).

—Using Hofmeister's method, 3 proteins were sepd. from the urine, all of which had the characteristic B.-J. properties. Adding successive amts. of  $(\text{NH}_4)_2\text{SO}_4$ , protein (A) sepd. at d. 1.04-1.07, (B) at 1.11-1.125, and (C) at 1.13-1.7. B is slowly pptd. by dil. HOAc, while C is not, and A is most easily pptd. The ratio of the 3 fractions was 1:20:100. In the presence of HOAc A and B coagulate at once, while C does so only at 60°; above this all behave the same, redissolving at about 75°; if now the temp. is lowered, recoagulation takes place at about 70°, and subsequent re-solution at about 90°; if this process is repeated, finally a portion remains pptd. even at 100°. The nature of the proteins is discussed and further work promised.

M. HEIDELBERGER

**Studies on the mutual precipitation of antibodies and antigens. III. Anticellular sera**—practical value of the precipitin reaction. M. NICOLLE AND E. CÉSARI. *Ann. inst. Pasteur* 34, 709-14(1920); cf. *C. A.* 15, 555.—Sera obtained on immunization of horses or rabbits with bacteria or other cells ppt. corresponding cell exts. This reaction permits the easy identification of antibodies and antigens when the concn. of these substances is high, as in the case of diphtheria and tetanus toxins and corresponding sera. When the conc. of a toxin is not high the coexistence of many other antigens and corresponding antibodies in immune sera interferes with the practical value of the reaction. The bacteriolytic power of serum cannot be estd. by this method.

E. R. LONG

**Antibody studies. III. A preliminary report on the chemical nature of bacterial antibodies.** F. M. HUNTOON, P. MASUCCI AND EDITH HANNUM. *J. Am. Chem. Soc.* 42, 2654-61(1920).—A large supply of antipneumococcal serum having become available as a result of the signing of the armistice, expts. were undertaken to devise methods for extg. or isolating the protective antibodies as free from other serum constituents as possible. The application of the principle of bacterial sensitization was utilized. Pneumococcus antigen variously treated was immersed in its specific serum and after allowing the antibodies to combine with or be adsorbed by the antigen the mixt. was centrifuged. The sediment of highly sensitized bacteria was then treated with various reagents in order to split off the protective antibodies from the antigen. The resultant soln. was candle-filtered and its antibody content detd. by protection tests on mice according to the U. S. Hyg. Lab. method. The filtered soln. was almost  $\text{H}_2\text{O}$ -clear, gave negative results with the usual protein color tests and the tests for S, P and monoamino acids, and contained 0.035 mg. total N per cc. and 0.028 mg. N per cc. in the phosphotungstic acid ppt. As the concn. of the antibodies in the exts. is probably at least as small as 1:100,000 the ordinary chem. methods are of very limited value in helping to det. their nature, but much information may be gained by indirect chem. and biological methods and by analogous reactions to known chem. substances. As the result of their work H. M. and H. conclude that the antibody mols. are of large size, as they do not dialyze. Antibodies are not affected by trypsin over considerable periods, so either they are not protein in nature, have been racemized by the dil. alkali used or belong to the peptide group having  $-\text{NH.CO}-$  linkages. They are not pptd. by solns. containing little or no electrolyte, indicating that they are not of a globulin nature. They are not sol. in  $\text{Et}_2\text{O}$ , are not pptd. or affected by short exposure to 30% NaCl, are not injured

by certain dil. acids and alkalies and are not affected by temp. up to 60°; higher temps. progressively destroy or alter their nature. Hence, they do not belong to that group of proteins usually considered under the head of serum proteins. CHAS. A. ROUILLER

**The specificity of the Wassermann reaction.** M. DURUP. *La presse medicale* 28, 636-7(1920).—Antigens prepd. from the heart and liver of a syphilitic fetus should be used. In cases of syphilis the liver antigen gives a more positive reaction than that of the heart. Reactions of equal intensity by both antigens point to syphilis if strong, otherwise to some other disease. A negative result from the heart antigen and a positive of the liver point to hereditary syphilis, syphilitic infection on the point of recovery or one just returning to positive, tabes, or an aged syphilitic. Negative results with both point to absence of syphilis, though this may occur in the case of an aged syphilitic or in tabes. H. A. SHONLE

**Immunization against contagious abortion.** ZWICK, ZELLER, KRAGE AND GMINDER. *Arb. Reichsgesund.* 52, 375-467(1920).—The efficiency of active and passive immunization, for prophylactic and therapeutic purposes, on pregnant and non-pregnant cows was tested upon a series of over 3000 animals. During the period of the expt. the cases of abortion among the inoculated decreased from 24.21% to 15.15%; among the controls, equal in no., the percentage increased from 16.31 to 22.68. The use of killed *B. abortus* vaccine reduced the no. of cases from 18.51% to 13.2%; when combined with an immune serum, from 21.76 to 13.6. A living vaccine caused a decrease from 29.09 to 6.36%; in conjunction with an immune serum, from 16.36 to 5.45. With any type of antigen the duration of immunity was highly variable, and the establishment of a resistant state bore a definite relation to the maturity of the animal. Passive immunization of animals near term failed entirely, although in active immunization non-infected pregnant cows responded with antibody production most favorably. G. H. SMITH

**Diagnosis and control of glanders by malleinization and blood examinations.** CL. GIESE. *Arb. Reichsgesund.* 52, 468-500(1920).—The ophthalmic test is to be preferred to other methods of mallein application, and of the serologic reactions agglutination and complement fixation are of greatest value, yielding results more trustworthy than the precipitin test or the conglutination or hemagglutination reactions. G. H. SMITH

**Lipoid and protein antibodies in typhoid immune serum, and the cause of the Neisser-Wechsberg phenomenon.** D. SCHLEMMER. *Arb. Reichsgesund.* 52, 538-72(1920).—An alc. ext. of typhoid bacilli was employed in the complement-fixation reaction and after completion of this reaction the mixt., as well as a control serum, was used in bactericidal tests. In both instances the limit of the Neisser-Wechsberg reaction was the 1/5000 diln. In the bactericidal test the control serum showed activity in the 1/1,000,000,000 diln., the fixation mixt. at 1/2,000,000 only. The lipoid ext. had deprived the serum of considerable bactericidal amboceptor. An ether ext. of the bacilli gave similar results. A portion of the ether ext. was evapd., the residue taken up in saline and this emulsion used as an antigen for rabbit inoculation. The immune serum produced showed a bactericidal activity in a diln. of 1/200,000 (control serum 1/5,000,000) but it failed to fix complement even in a 1/5 diln. (control 1/5000). From these expts. S. concludes that the bactericidal amboceptor of typhoid serum is directed against lipoids rather than against proteins. Similar expts. with aq. exts. of lipoid-free bacteria indicated that the complement-fixing antibodies are directed against protein or its split products. The theoretical aspects of these findings, as applied to serological methods and to serum therapy, are discussed. G. H. SMITH

#### H—PHARMACOLOGY

ALFRED N. RICHARDS

**The pertussis remedy "thymipin." A drug with indirect curative effect.** HERNZ AND SCHOTTENHEIM. *Univ. Erlangen. Münch. med. Wochschr.* 67, 771-2(1920).

—Thymipin is the dialyzate from *Drosera rotundifolia*, *Thymus vulgaris* and *Pinguicula alpina*, of which 1 cc. corresponds to 1 g. fresh plant. Its administration in cases of whooping cough has been recommended. A number of healthy normal individuals received subcutaneously thymipin or extract of *Drosera*. This was followed by a watery catarrh of the mucous membrane of the nose which, as a rule, disappeared within 24 hours. Subcutaneous injections in mice produced deep respiration and severe dyspnea, due to pronounced reddening and swelling of tracheal and bronchial mucous membrane. Guinea pigs and rabbits showed hyperemia of trachea and the larger air passages. In some cases lymph glands were swollen, in others the spleen, showing a stimulation of lymphocyte producing tissue. This was not const., did not occur in rabbits, in which the lymphocytes of the blood were not increased. S. AMBERG

**Intoxication with fluorine compounds.** KOCKEL, AND ZIMMERMANN. Univ. Leipzig. *Münch. med. Wochschr.* 67, 777-9(1920).—Two cases of fatal F poisoning are reported, one due to a rat poison, "Orwin," containing NaF, the second a case of murder. The course of the intoxication does not show anything pathognomonic for F. To demonstrate the F, the organs were boiled with water, the filtrate evapd., the residue treated with  $H_2SO_4$ , heated and the vapors were tested in the usual way for their power to etch glass. The stomach and its contents as well as the small intestines gave a positive test. Liver, kidneys, spleen and blood did not. S. AMBERG

**The value of simultaneous salvarsan therapy from the clinical point of view (with special regard to silver-salvarsan).** W. WAGNER. Univ. Jena. *Münch. med. Wochschr.* 67, 780-1(1920).—Silver-salvarsan is not superior to other salvarsans. S. A.

**Anesthesia experiments with eucupine.** H. PICARD. Univ. Frankfurt. *Münch. med. Wochschr.* 67, 808-10(1920).—The infiltration anesthesia with 0.2% eucupine dihydrochloride is very satisfactory and lasts much longer than the novocaine anesthesia. The initial pain can be avoided by injecting equal amounts of eucupine and 0.5% novocaine adrenaline soln. But in 7 of 14 cases the injections were injurious to the tissues and irritating, producing particularly edema lasting several days. Eucupine dissolved in olive oil proved of great benefit as local anesthetic in diseases of the bladder. Eucupine ointment was beneficial in X-ray burns. S. AMBERG

**Eukodalism.** A. ALEXANDER. *Münch. med. Wochschr.* 67, 873-4(1920).—Eukodal can produce a state of excitation and other symptoms. A patient having received eukodal for some time reacted to its withdrawal with severe symptoms. Eukodal is an opium preparation. S. AMBERG

**Experimental and clinical data about the action of optochin.** R. SCHNEIDER. *Münch. med. Wochschr.* 67, 1006-8(1920).—Optochin has a specific action against pneumococci but is much more inhibiting than bactericidal, because the latter action is interfered with by the precipitating action of proteins. Concn. greater than 0.5-1% on subconjunctival injection injure the tissues; instillation of solns. stronger than 1% in the eye is also injurious. It has no advantage over other drugs. S. AMBERG

**The pharmacology of oxidizing substances.** V. WILLI RIEDER. Göttingen. *Z. exp. Med.* 10, 169-210(1919).—Quinine and methylene blue may be added to the list of substances that affect the aorta. Their action consists of necrosis of the media in the aorta of the rabbit. Hydroquinone is inactive. This indicates that the re-sorptive activity of quinone as well as of this whole group of oxidizing substances is a function of their oxidizing action. Quinone and methylene blue produce edema of the lungs. The action of oxidizing substances on the vessel walls leads to definite anasarca. The ease with which arterial changes may be produced varies with the species and is due to differences in structure of the normal aorta in these animals. The action of different oxidizing substances varies with the mode of introduction; acetylchloroamino-benzene affects the aorta of guinea pigs following percutaneous, quinine and methylene blue upon intravenous and subcutaneous injection. In rabbits, the acute effect may



be on the elastic tissue or upon the muscularis. The fatal edema of the lungs may be controlled by atropine, and by this means larger doses may be used and the production of aortic necrosis made.

E. B. FINK

The structure and action of organic bases and their ability to unite with alkaloids. S. LOEW. Göttingen. *Z. exp. Med.* 10, 223-4(1919); cf. *C. A.* 14, 1153.—Polemie.

E. B. FINK

The action of digitalis upon color perception. F. BOHNENBERGER. Tübingen. *Z. exp. Med.* 11, 138-43(1920).—Digitalis had no effect upon color perception, light or wave length.

E. B. FINK

Absorption and elimination of manganese ingested as oxides and silicates. CLARENCE K. REIMAN AND ANNIE S. MINOT. Harvard Med. School. *J. Biol. Chem.* 45, 133-43(1920); cf. *C. A.* 14, 2351.—"Ores containing Mn as oxides and silicates are sol. in gastric juice. Mn is absorbed in the blood stream causing in most cases a slight temporary rise in Mn concn. followed by a quick return to normal. In none of the cases studied was the Mn content of the blood more than double the normal level, and in some of the subjects no increase was noted. We suggest that individuals of the first group would probably be more susceptible to Mn poisoning than those of the latter. Even prolonged feeding of large amts. of Mn ore to dogs failed to produce significant changes in Mn content of blood and tissues or to cause any pathological symptoms. Mn ores are thus very non-toxic and in order to produce symptoms of poisoning must be ingested by individuals who are peculiarly susceptible. Clinical experience (Edsall, Wilbur and Drinker, *C. A.* 13, 3243) has demonstrated that such persons are extremely rare."

I. GREENWALD

Hemolytic and anemia-producing action of oleic acid and triolein in the rabbit. LUIGI PONTICACCIA. Firenze. *Sperimentale* 74, 35-53(1920).—While oleic acid (A) has a strong hemolytic action *in vitro* its hemolytic action *in vivo* is not like that of toluylene diamine or sp. sera, but takes place through a direct physico-chem. mechanism like that *in vitro*, but greatly diminished in its intensity by the slow passage of A into the circulation. The animals die from acid toxemia, not pernicious anemia. Large quantities of linseed, cottonseed, and olive oils also produce only a slight degree of anemia when given *per os*, referable to the obstruction of digestion by the mass of oil.

M. HEDELBERGER

A pharmacological study of benzyl benzoate. EDWARD C. MASON AND CARL E. PIERCK. Univ. Cincinnati. *J. Lab. Clin. Med.* 6, 62-77(1920).—Benzyl benzoate has been used clinically in the treatment of all conditions featured by increased tonus of the gastro-intestinal tract, and spasm of smooth muscle in other locations, and to relieve arterial tension. Experimentally in dogs it was found to produce a prompt and prolonged fall in arterial pressure, when 4 cc. of a 10% suspension was injected. Relaxation of intestinal tone previously increased by injection of  $\frac{1}{2}$  cc. 0.5% BaCl<sub>2</sub>, was distinct with 2 cc., but not equal to that produced by  $\frac{1}{2}$  cc. 1:10,000 adrenaline. Spleen and kidney volume were reduced in size corresponding to the fall in arterial pressure. Only slight relaxation was produced on the uterus *in situ* previously contracted with pituitrin. It did not produce bronchial dilation in pithed dogs following ergamine contraction, unlike adrenaline. It had little effect on pulmonary pressure, and therefore probably would be of no avail in the treatment of hemoptysis.

E. R. LONG

Iodine excretion in human urine and the use of iodine salts in absorption tests. RUDOLF COBBT. *Arch. exp. Path. Pharm.* 87, 114-34(1920).—For tests of comparative values the detn. of I excretion can best be made within 3 hrs. of the administration of the drug. Different individuals show marked variation in the urinary excretion of I after intravenous injection, but different tests in the same person indicate considerable uniformity in absorption and excretion and the amt. eliminated closely parallels the

t. administered. In an individual a difference greater than 20% in excretion, as shown by repeated tests, indicates disturbance in absorptive velocity. G. H. SMITH. **Effect of solvent on the elimination of uric acid after intravenous injection.** MAX ROGER. *Arch. exp. Path. Pharm.* 87, 392-405 (1920).—Uric acid, dissolved in 0.1 N NaOH or in 1% piperazine, was injected intravenously in amts. of 0.5 gm. The percentage elimination was detd. as follows: When dissolved in NaOH the total elimination was 27% of which 17.6% occurred on the day of the injection; when dissolved in piperazine corresponding figures were 52.2% and 29.2%. G. H. SMITH.

**Action of nicotine on the isolated frog heart.** JOHANNES HETT. *Arch. exp. Path. Pharm.* 88, 30-8 (1920).—Nicotine acts (a) through an effect on the vagus, spontaneously reversible and prevented by atropine, (b) through a disturbance of the nervous mechanism of the heart, and (c) through direct damage to the heart muscle. G. H. S.

**Pharmacological action of defibrinated blood.** HERMANN FREUND. *Arch. exp. Path. Pharm.* 88, 39-79 (1920).—The toxicity of defibrinated blood is not associated with agulation phenomena, since citrated blood, without destruction of the platelets, is as toxic as that which has been defibrinated. G. H. SMITH.

**Chemistry and pharmacology of digitoxin and its cleavage products.** M. CLOETTA. *Arch. exp. Path. Pharm.* 88, 113-57 (1920).—Digitoxin as usually prepd. was subjected to purification by pptg. the alc. soln. with lead acetate and  $\text{NH}_3$ . The ppt. was washed with the filtrate freed of Pb with  $\text{H}_2\text{S}$ . The material was concd. *in vacuo* on the water bath and as turbidity appeared  $\text{NH}_3$  and  $\text{CHCl}_3$  were added with shaking. After complete drying the residue was dissolved in warm alc. which was reduced to 40% by the subsequent addition of warm water. Upon cooling the digitoxin crystd. Repeated re-solution and crystn. further purified the product so that the final yield amounted to 40% of the "raw" digitoxin. The pure digitoxin,  $\text{C}_{41}\text{H}_{70}\text{O}_{14}$ , m.  $252^\circ$ , when heated *in vacuo* a cryst. compound sublimes,  $\text{C}_{41}\text{H}_{70}\text{O}_{14}$ , m.  $114^\circ$ , sol. in water, alc. ether,  $\text{CHCl}_3$ , acetone, glacial acetic acid, etc., giving a Keller reaction but none of the sugar reactions, combining with I and Br, pharmacologically inactive. The residue, digitan,  $\text{C}_{41}\text{H}_{70}\text{O}_{10}$ , acts as digitoxin pharmacologically, and is split by acids quantitatively into 1 mol. of digitoxigenin and 2 mols. of digitoxose. Purified digitoxin is split by acids into 1 mol. digitoxigenin, 2 mols. digitoxose, and 1 mol. of an oily substance, the last being the equiv. and possessing the same properties as the fraction which sublimes. Digitoxigenin,  $\text{C}_{29}\text{H}_{48}\text{O}_4$ , m.  $245^\circ$ , gives first a yellow ring and then a clear green color in Keller's reaction. It possesses considerable pharmacol. activity on the heart but differs both quantitatively and qualitatively from digitoxin. When treated by acid and heat digitoxigenin yields anhydrodigitoxigenin,  $\text{C}_{28}\text{H}_{46}\text{O}_3$ , m.  $184^\circ$ . This prepn. is inactive and can be secured directly from digitoxin by intensive acid hydrolysis. Digitoxigenin yields digenic acid,  $\text{C}_{28}\text{H}_{48}\text{O}_4$ , m.  $244^\circ$ , pharmacol. inactive. The digitoxose secured by this method corresponds to that of Kiliani except that it m.  $107^\circ$  instead of  $101^\circ$ . Digitoxin acts because of the presence of several hydroxyl groups. Treatment with  $\text{ZnCl}_2$  or stearyl chloride gives substitution products which are pharmacol. inert. In the same way the benzoylation of digitan destroys its activity. Acetylation of digitoxigenin gives a product without action on the heart, although it is not inert. G. H. S.

**Effect of calcium and potassium ions upon heart intoxications.** S. G. ZONDEK. *Arch. exp. Path. Pharm.* 88, 158-71 (1920).—Arsenic and quinine, although chemically unrelated, act similarly upon the heart, causing diastolic cessation. Ca restores the loss in contractility. Simultaneous administration of Ca and As, or Ca and quinine shows the effect of the Ca in lessening or completely inhibiting the action of the poisons. K ions intensify the effects of As and quinine. G. H. SMITH.

**Antagonism between pilocarpine and adrenaline.** ERNST BILLIGHEIMER. *Arch. exp. Path. Pharm.* 88, 172-8 (1920).—The antagonistic effect was manifested in their action upon sweat glands. G. H. SMITH.

**Synergistic action of guanidine and barium.** HERMANN FÜHNER. *Arch. exp. Path. Pharm.* 88, 179-91(1920).—Mixts. of guanidine and Ba when tested upon isolated frog muscle show at least double the activity of either substance alone.

G. H. SMITH

**Theory of magnesium narcosis.** ERNST WIECHMANN. *Arch. ges. Physiol.* 182, 74-103(1920).—From a study of the action of Mg on animal and plant tissues the author concludes that the term "magnesium narcosis" is a misnomer from the physiologic as well as from the physicochem. point of view. Mg acts primarily upon the synapsis, not only in nerve-muscle preps., but also in automatic organs as the heart, stomach and intestine. Ca always exerts an antagonistic effect, but in the action of Mg on muscle the effect is not abolished. Co, Mn, Ni, and complex Co salts can be substituted for Mg; and Sr or Ba can replace Ca. Colloid chem. may provide an explanation for the action of the ions.

G. H. SMITH

**Mechanism of the toxic action of aromatic nitro compounds.** GÜNTHER HERTWIG AND WERNER LIPSCHITZ. *Arch. ges. Physiol.* 183, 275-88(1920).—Bacteria, spermatozoa, as well as muscle cells, reduce dinitrobenzene, dinitrotoluene, trinitrobenzene and trinitrotoluene. The toxic action of these compds. parallels the appearance of the nitrophenylhydroxylamine reaction. The relative ease of biological reduction is the same for all cells investigated, dinitrobenzene and toluene being reduced most readily. *m*-Dinitrobenzene showed an increase in toxicity for spermatozoa when it was combined with alc., chloral hydrate, nicotine, or saponin. The physiol. functions of cells can be increased in association with an increase in heterogenetic intoxication. Small amts. of alc. show but slight activity on cells; small amts. of nitro compds. act as moderately strong poisons; both together react differently from either alone. The alc. affects the cell structure, increases the area, and thereby cell function. The nitro group affects cell respiration, and is by this stimulation converted into toxic hydroxylamine groups of such number that the oxide-reducing cell processes can be increased many fold by small amts. of narcotics. Larger amts. of narcotics inhibit these processes. Narcotics in small amts. → increased cell respiration → increased nitro reduction → increased hydroxylamine (toxic) action.

G. H. SMITH

**Heart muscle preparations under various conditions.** EMIL ABDERHALDEN AND ERNST GELHORN. *Arch. ges. Physiol.* 183, 303-32(1920).—The passage of air through the Ringer soln. in which a heart prepn. is suspended increases the size and frequency of the pulse, the duration of the period of spontaneous contraction and the capacity for work. Temporary deprivation of O results in a decrease in the strength of the pulse, with or without lessening its frequency. Renewed application of O strengthens the pulse and accelerates the frequency even though there has been no retardation due to lack of O. The most active agency for stimulating automatic contraction is *M*/1200 BaCl<sub>2</sub>; for this purpose CaCl<sub>2</sub>, *M*/1200-*M*/150, or MgCl<sub>2</sub>, *M*/600-*M*/200, failed. Rarely FeCl<sub>2</sub> *M*/500 or SrCl<sub>2</sub> *M*/300 was successful. Sr was more effective than Ca in prolonging the automatic period. At times both salts increased the latent period. Mg diminished pulsation, lengthened the latent period and shortened the time of automatic activity. Fe may act in either direction, strengthening the pulse and shortening the latent period, or weakening the pulse and prolonging the latent period. It has no effect on the duration of the automatic contraction.

G. H. SMITH

**Antagonism between poisons: pilocarpine and atropine.** J. W. LÉHOUX, W. STORM VAN LEEUWEN AND C. VAN DEN BROEKE. *Arch. ges. Physiol.* 184, 215-35 (1920).—The action of pilocarpine upon the surviving intestine is dependent upon the concn. of the drug, and its action is completely reversible. The antagonistic action of atropine is related to the concn. and not to the absolute amt. which is present. In not too great doses its action is also completely reversible. The amt. of atropine required to overcome a submaximal pilocarpine reaction is about 3 times as large as the

amt. of atropine requisite to inhibit that quantity of pilocarpine which would exert a slight action.

G. H. SMITH

**Quantitative distribution of particulate material (manganese dioxide) administered intravenously to cats.** CECIL K. DRINKER AND LOUIS A. SHAW. Harvard Med. School. *J. Exp. Med.* 33, 77-98(1921).—MnO<sub>2</sub> suspended in an acacia-NaCl soln. provides a non-toxic injection which in the present expt. has contained no particles larger than 1 $\mu$ , and which, when deposited in the body, can be detd. quant. and seen microscopically. Intravenous injections have been made under precautions which preclude removal from the blood or deposition in organs through simple capillary blockage. In 9 expts. out of 13, the circulating blood contained no MnO<sub>2</sub> after 18 min. In the 4 remaining expts. there was a steady slight elimination which was incomplete at the end of 1 hr. Within certain limits the rate of removal from the circulating blood and the sites of deposition in the animal are independent of the concn. of the suspension, the blood pressure or antecedent introduction of acacia or histamine. In the cat amts. of MnO<sub>2</sub> varying between 9.8 and 3.9 mg. of Mn and containing from 10<sup>10</sup> to 5  $\times$  10<sup>10</sup> particles, if injected intravenously, permit recovery at the end of 1 hr. of 90% of the material in the following proportions: lungs, 47%; liver, 38%; spleen, 4.3%. These expts. make it clear that in certain organs—the lungs, liver and spleen of the cat—the vascular endothelium possesses phagocytic power rendering the capillaries permeable to particulate material as well as to gases, liquids and dissolved solids.

C. J. WEST

## I—ZOOLOGY

R. A. GORTNER

**Experimental studies on primary inhibition of the ciliary movement in *Beroë cucumis*.** GUSTAF FR. GÖTHLIN. Upsala, Sweden. *J. Exp. Zool.* 31, 403-41(1920).—This is a study of the inhibitory effect of mechanical, chem. and electrical stimuli on the movements of the swimming plates in the ctenophore, *Beroë*. A current density of 2 milliamps. per cm<sup>2</sup>. sufficed to bring about a primary inhibition when the current was made to pass in the longitudinal direction of the animal with the cathode outside the sensory pole. The inhibitory effect issued from the cathode. Chloral hydrate (0.2%) and atropine (<0.3%) abolished the primary inhibitory effect of this current and brought about an acceleration of the ciliary motion. Similar results have been obtained with other marine forms (*Bolina*, *Pleurobranchia*). The inhibitory effect cannot be explained without the assumption, at least from the physiological point of view, of formations which serve as inhibitory nerves. Receptor organs at the body surface are also probably present. Individuals with the statoliths removed showed the same primary inhibition as normal individuals. The primary inhibitory mechanism was closely connected with a secondary (muscular) inhibitory mechanism; the former was stimulated by weaker impulses than the latter.

CHAS. H. RICHARDSON

**Factors influencing the water content and rate of metabolism of certain Orthoptera.** JOSEPH HALL, BODINR. Univ. Penn. *J. Expt. Zool.* 32, 137-64(1921).—This investigation concerned the changes occurring with age, or due to differences in species and sex, and the effects of starvation and hibernation, in grasshoppers. Four species were used: *Melanoplus femur-rubrum*, *M. differentialis*, *Dichromorpha viridis*, and *Chortophaga viridifasciata*. CO<sub>2</sub> was detd. by the method of Lund (*C. A.* 13, 1328). The % H<sub>2</sub>O in these insects decreased with age and with increasing body wt. to a min. for the species; different species of the same genus may have a different % H<sub>2</sub>O in the body. In *C. viridifasciata* the H<sub>2</sub>O content fell to a min. during hibernation, rose to a max. when hibernation was ended, and decreased again as old age approached. These changes were probably due to the effects of temp. and advancing age. Water and temp. were the factors which controlled the emergence of *C. viridifasciata* from hibernation. Three of the species survived starvation for the following periods when given only H<sub>2</sub>O: *M.*

*differentialis* 172 hrs., *M. f.-rubrum* 144 hrs., *C. viridifasciata* 170 hrs. Without H<sub>2</sub>O death occurred earlier. The result of starvation was a loss in body wt., H<sub>2</sub>O and solids, H<sub>2</sub>O showing the greatest relative loss. Large individuals tended to lose relatively larger amts. during starvation than smaller individuals. The rate of CO<sub>2</sub> output varied with the species studied. Lighter and younger insects had higher rates of CO<sub>2</sub> output than heavier and older individuals. The ratio of CO<sub>2</sub> output to the  $\frac{2}{3}$  power of the body wt. was more constant than the ratio to the body wt., indicating that the surface law may hold for grasshoppers as well as for mammals. High temps. caused increased rates of CO<sub>2</sub> output, and low temps. tended to produce the opposite effect. The temp. coeffs. for the different temps. were variable and considerably lower than those found for other biol. processes. Starvation decreased the rate of CO<sub>2</sub> production; upon feeding starved individuals, the rate was again increased. "By a comparison of these data with those found for mammals, striking similarities are found to exist, and these would seem to indicate that the problem of insect physiology, although at first seemingly unrelated to that of mammals, has, in fact, many points in common with it." CHAS. H. RICHARDSON.

Pyroligneous acid as a substitute for acetum sabadillae in louse control. L. LANGE. *Arb. Reichsgesund.* 52, 554-72(1920).—Pyroligneous acid, and an artificial acetum sabadillae (veratrine 0.4, tinc. ratanhia 2.5, acetic acid 28, water 400) were tested in comparison with the true sabadillae as delousing agents (*Pediculus capitis*). The results were essentially the same with all three compds. G. H. SMITH

## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Chemistry of foods. ARNOLD R. TANKARD. *Chem. Age (London)* 3, 501(1920).—A plea for a revision, consolidating food laws in England. H. A. LEPPER

Food colors. MELVIN DEGROOTE. *Tea and Coffee Trade J.* 40, 100, 102(1921).—G. discusses the certified coal tar deriv. colors and vegetable colors and their application in foods. The relation of these colors to ext. manuf. is noted. C. W. T.

Report on water in foods and feeding stuffs. J. O. CLARKE. *J. Assoc. Off. Agr. Chem.* 4, 48-55(1920).—Six different methods for detg. H<sub>2</sub>O were studied by collaborators on cottonseed meal, wheat bran, corn meal and air-dried silage, and six methods were tried on dried apples. Heating in vacuum at 100° gives higher results than any other heating methods in general use. Different heating methods give somewhat different results on the same sample. The H<sub>2</sub>SO<sub>4</sub>-vacuum method gives results agreeing well with heating in vacuum at 100°. This method was recommended for official adoption. Best results are obtained with a pressure less than 2 mm. the completeness of drying depending largely on the last few mm. exhausted. The CaO-vacuum method gives slightly lower results than when H<sub>2</sub>SO<sub>4</sub> is used and requires a somewhat longer time. The carbide-vacuum method is equal in efficiency to the CaO method. These 2 methods were recommended for tentative adoption. Dried apples and similar products cannot be dried above 70° without decompn. None of the vacuum desiccator methods removes all the H<sub>2</sub>O from apples, giving results lower than the empirical method of drying 4 hrs. in H<sub>2</sub>O oven. Heating or desiccator methods did not affect the subsequent Et<sub>2</sub>O ext. results on feeding stuffs. Substances which dry on heating, e. g., meat, give more satisfactory Et<sub>2</sub>O extn. if dried by desiccator methods. H. A. LEPPER

Report on crude fiber. C. K. FRANCIS. *J. Assoc. Off. Agr. Chem.* 4, 39-41(1920).—Collaborative results reported show that the one-filtration method does not check the official method, results being higher, and does not give checks between different analysts. Cf. C. A. 14, 781. H. A. LEPPER

**Report of the National Committee on Milk Standards.** ANON. *U. S. Pub. Health Repts.* 35, 2955-8(1920).—This paper reviews the program for the meeting in New York. The subjects of pasteurization, scurvy, infected udders and a service bureau were discussed.

FRED W. TANNER

**Factors influencing the viscosity of sweetened condensed milk.** L. A. ROGERS, E. F. DRYSDEN AND F. R. EVANS. Dairy Division, U. S. Dept. Agr. *J. Dairy Sci.* 3, 468-85(1920).—Exptl. sweetened condensed milks were made to study the cause of thickening wherein the increase in viscosity proceeds uniformly throughout the can, and where there is no marked change in flavor. In this type of thickening no real curd is formed and the thickened milk can be mixed with water without the sepn. of definite flecks. Acidity within reasonable limits, air contained in the can and copper salts have no significant influence on the increase of viscosity. Cane sugar increases the initial viscosity slightly but affects the increase only as it inhibits growth of bacteria. The viscosity increases with increase of storage temp. but not proportionally. The effect is slight at 20° or lower but marked at 30° or higher. The tendency to thicken on standing increases with but not in direct relation to the concn. of solids not fat. Casein is the constituent principally concerned in the production of viscosity and albumin, when the forewarming temp. is much above its coagulating point. Increase of total phosphates of the raw milk by as much as 7% will cause acceleration in the progressive increase in viscosity probably through combination with casein. High temp. ordinarily used during forewarming increases tendency to thicken. Milk forewarmed at 63° for 20-30 min., a satisfactory procedure from a bacteriological view-point, gives a product of low viscosity with a reduced tendency to increase on storage, although fat may sep. under this procedure, a condition which probably would not occur under com. conditions.

H. A. LEPPER

**Bitterness in evaporated milk.** GEORGE SPITZER AND W. F. EPPLE. Purdue Univ. *J. Dairy Sci.* 3, 486-92(1920).—An organism which agrees morphologically and culturally with *B. panis nigula* of Lawrence and Laubach was found to cause bitterness in sweet or evapd. milk. Its thermal death point lies between 8-10 min. exposure to 250° F. under steam pressure. The results on neutral, acid and basic substrate indicate the presence of more than one specific enzyme and the secretion of this organism is proteolytically active, producing both peptones and amino acids.

H. A. LEPPER

**Bacterial control in milk plants.** RUSSELL S. SMITH. U. S. Dept. Agr. *J. Dairy Sci.* 3, 540-54(1920).—Investigations, observations and bacterial exams. in 92 milk plants in 27 cities are the basis for a discussion of the bacterial control of pasteurization and of the factors which may subsequently affect the milk. Cf. *C. A.* 14, 986.

H. A. LEPPER

**The effect of pasteurization on the number of bacteria in milk when this is determined by the direct microscopic count.** E. G. HASTINGS AND AUDREY DAVENPORT. Univ. Wis. *J. Dairy Sci.* 3, 494-501(1920).—A direct microscopic count of bacteria in pasteurized milk gives a very imperfect picture of the bacterial content of the same milk before pasteurization; the number of bacteria revealed may not be over 3% of those originally present. This conclusion is drawn from the data presented and confirmed by results not reported here.

H. A. LEPPER

**Is ropy milk becoming a more serious dairy trouble?** H. A. HARDING AND M. J. PRUCHA. Univ. Ill. *J. Dairy Sci.* 3, 402-21(1920).—This treatise deals primarily with that type of ropiness which appears in sweet well cared-for city milk which disappears as soon as the milk begins to sour and is a discussion of the condition on the farm and method of distribution of the milk in connection with the Chicago ropy-milk epidemic of 1919. The causal organism, a member of the *Bacterium aerogenes* group, with special emphasis on its resistance to heat, is discussed. Proper pasteurization of

milk at 140–145° F. for 30 min. should destroy any ropy-milk organisms. Factors influencing distribution and control methods are given.

H. A. LEPPER

**A comparison of the butter fat content and the total-solids content of creams of varying richness separated from the same sample of milk.** B. A. STIRITZ AND O. R. OVERMAN. Univ. Ill. *J. Dairy Sci.* 3, 522–8(1920).—Cream from samples of milk representing 4 breeds (Jersey, Guernsey, Ayrshire and Holstein) and mixed milk as received at a milk plant were sepd. by 4 different separators into 4–5 different creams varying in butter fat content to study the relation between the butter fat content and solids-not-fat (snf.) of cream. The formula commonly used: snf. = wt. of milk or creams minus (the fat multiplied by 8.9%) does not give actual serum solids content but is only an approximation. The largest variation by actual analysis from calcn. is 0.5% and is considered large as snf. is not over 6–7% in cream used for ice cream mixes. The % total solids varies in direct proportion with increase in % of butter fat. The % of snf. decreases as butter fat increases but not in definite inverse proportion, decreasing rapidly until fat = 20% then slower as fat increases from 20 to 45%, over 45 the ratio is similar to that below 20%. Source of supply or type of sepn. did not seem to affect the results.

H. A. LEPPER

**A study of the incorporation of proteins in creamery butter.** R. W. WYANT. Mich. Agr. Coll. *J. Dairy Sci.* 3, 452–67(1920).—Exptl. churnings of cream were made by different procedures varying from the normal to make a possible variation in the protein content of the finished butter. A normal churning according to good factory methods was made each time as a check. The av. protein (N by Gunning method  $\times 6.38$ ) content for normal butter was 0.3727, for butter which was worked in the butter-milk 0.5264 and for unwashed butter was 0.5177%, loss of protein due to washing being 0.1450%. The protein content of unwashed butter churned at 65° F. was 0.5407 and of butter to which starter had been added was 0.4718%. Nitrogenous compds. were not incorporated in butter to any appreciable extent by working it in buttermilk, over-churning in the presence of buttermilk, not washing, churning at high temp., or adding starter after churning. An allowance of 1% was found to be sufficient for all constituents of butter which may be classified under the term curd. By incorporating 15.5% of H<sub>2</sub>O and allowing 1% for curd as much as 3.5% of salt may be incorporated without reducing the fat content of the butter below 80%. Speckled butter or milky brine was not found in any of the samples of finished butter. The keeping quality of washed butter (one exception) was slightly better than unwashed. Excessive over-run is probably due to the incorporation of H<sub>2</sub>O and not to curd under modern factory conditions.

H. A. LEPPER

**Statutory standard for ghee.** T. K. GHOSE. *Analyst* 45, 444–7(1920).—The analyses of 67 samples of ghee, clarified butter from individual Indian buffaloes, and 66 samples from herds are reported. The values for Reichert-Wollong value are: max. 42.0, min. 29.2, av. 34.5. Only 1 out of 233 gave minimum below 30. Pure samples should show a value of 30 or above. A sample showing 28 or lower should be regarded as adulterated. Admixture of cow butter may lower the value. No statutory standard has been laid down. Sapon. no., m. p.,  $n_D$  (butyro) are given on above samples. H. A. L.

**Emulsion problems in margarine manufacture.** WM. CLAYTON. *Chem. Age (London)* 3, 469–70(1920).—The 3 main points in the making of a margarine emulsion are discussed; factors depending on (a) the degree and mode of agitation employed in mixing, (b) the animal and vegetable oils and fats used, and (c) the H<sub>2</sub>O, milk and other ingredients employed.

H. A. LEPPER

**The manufacture of Liebig's meat extract.** UDO KLUENDER. ASUNCION. *Chem.-Ztg.* 44, 837–8(1920).—The process of manuf. of Liebig's meat extract as used by the Lemco or Oxo Co. of Fray Bentos and of Colon-Entre Rios, Argentine, is described.

H. A. LEPPER

**Examination of sweetening compounds.** W. OLSZEWSKI. *Pharm. Zentralhalle* 61, 583-5(1920).—The following tests were used to detect all the common adulterants of saccharin: The detn. of  $\text{NH}_3$  by  $\text{MgO}$ , detn. of  $\text{CO}_2$ , detn. of ash, detn. of sweetness, presence of sugars, and qual. and quant. tests for saccharin. Sweetness is detd. by dissolving 1 g. in 1 l.  $\text{H}_2\text{O}$ , adding  $\text{Na}_2\text{CO}_3$  if necessary, and dilg. 10 cc. until the sweetness has disappeared. Pure saccharin requires a diln. to 700 cc. *Dulcin* can be sep'd. from saccharin by extg. the Ca salt with  $\text{Et}_2\text{O}$ . *p*-Saccharin does not give its N as  $\text{NH}_3$  on hydrolysis with dil.  $\text{H}_2\text{SO}_4$  while saccharin does.

H. A. STONLE

**What degree of sweetness does saccharin possess?** OSKAR BEYER. *Schweiz. Chem.-Ztg.* 1920, 588-9.—The sweetness of  $\text{H}_2\text{O}$  solns. of saccharin does not increase as rapidly as the concn.; it varies in usual concn. (corresponding to 2-10% sugar soln.) between 200-700. The sweetness of a  $\text{H}_2\text{O}$  soln. containing saccharin and other artificial sweeteners is equal to the sum of sweetness caused by the sep. substances. Cf. *C. A.* 14, 2772.

H. A. LEPPER

**Problems in vanilla percolation.** MELVIN DEGROOTE. *Simmons' Spice Mill* 43, 1470, 1472, 1474(1920).—A short concise article dealing with the various factors affecting vanilla percolation, including selection of the bean, moisture content of the bean, use of glycerin in the percolate, type of percolator, method of percolation, reduction of the bean for percolation, alc. percentage of the percolate, final aq. diln. of the percolate, etc.

C. W. TRIGG

**Designation of vanilla products.** MELVIN DEGROOTE. *Tea and Coffee Trade J.* 39, 358, 360, 362(1920).—G. gives a brief concise discussion of the various federal and state statutes affecting the designation of vanilla products, including exts., flavoring, substitutes, imitations, compds., non-alcoholic vanilla, etc.

C. W. TRIGG

**The alcoholic content of flavoring extracts.** MELVIN DEGROOTE. *Simmons' Spice Mill* 43, 2086, 2088(1920).—Difficulties in detg. a com. minimum alc. % for the various flavoring exts. are discussed. The different functions the alc. may serve in an ext., and factors entering into an actual lab. detn. of the minimum alc. content are noted.

C. W. TRIGG

**The use of vegetable gums in food flavors.** MELVIN DEGROOTE. *Simmons' Spice Mill* 43, 1652, 1654, 1656(1920).—G. discusses the various colloids used in emulsion manuf. and indicates why the vegetable gums, such as acacia, tragacanth, and karaya are best suited for use in food flavors.

C. W. TRIGG

**Carbohydrates of the pecan.** W. G. FRIEDEMANN. *J. Am. Chem. Soc.* 42, 2286-8 (1920).—The kernels were found to contain moisture 3.75, ash 1.70, crude protein 12.27, crude fiber 1.71, N-free ext. 10.81 and  $\text{Et}_2\text{O}$  ext. 69.76%. The carbohydrates (13.00% of the moisture-free kernels) were detd. on the flour obtained from the kernels by completely removing the oil with  $\text{Et}_2\text{O}$  and have the following compn.: Sucrose 9.03, invert sugars 21.90, araban 14.82, methylpentosans 1.68, cellulose (crude fiber) 14.29, amyloid 4.54, tannins 2.57, hemicellulose (dextran), etc., 31.17%.

C. A. ROUILLER

**Optical properties of Japanese millet jelly.** MITSU HARU FUKUDA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 183-5(1920).—The indices of refraction, the rotatory dispersion and the absorption spectrum of Japanese millet jelly were studied. The substance is a mixt. of maltose, glucose and dextrose. The index was found to vary from 1.495 for 6563Å. to 1.511 for 4063Å. The value for sodium light was 1.497. The rotatory dispersion was found to be levo and differed according to the wave length. For instance where  $\lambda = 6439$ ,  $\varphi = -1^\circ.5$  and where  $\lambda = 4230$ ,  $\varphi = -3^\circ.9$  per 1 mm. thickness. The jelly is slightly yellow and absorbs the violet end of the spectrum. Thus a portion 2.4 mm. thick completely cuts off the light from  $\lambda 330\mu$  to the extreme ultraviolet.

E. B. SPEAR

**Use of "cipollaccio" for food and the production of alcohol.** E. PANTANELLI. *Stas. sper. agrar. ital.* 53, 101-12(1920).—Analyses are given of the January and of



the early June gatherings of the two varieties (*muscaria comosum* and *Hyacinthus ciliatus*) of "cipollacio" used as food. There is also given a method of hydrolysis of the bulbs and of subsequent alc. fermentation.

ALBERT R. MERR

Remarks on the procedure for the clarification of alleged-feeding stuff poisoning cases. WERNER STIECK. *Mitt. Lebensm. Hyg.* 11, 237.—Procedure is proposed for handling suspected cases of feed poisoning to improve the unsatisfactory results now being obtained in such investigations.

H. A. LEPPER

The food values of New Zealand fish. MRS. DOROTHY E. JOHNSON. *Trans. and Proc. New Zealand Inst.* 52, 20-6(1920).—Tables are given showing the water, fat, protein and ash content of 11 common New Zealand sea fish; also tables showing the calcd. caloric values and the cost per cal.

L. E. GILSON

Report on stock feed adulteration. B. H. SILBERBERG. *J. Assoc. Off. Agr. Chem.* 4, 41-8(1920).—In detg. grit and weed seeds in stock feed some mechanical method of mixing and sampling in which the personal factor is reduced to a min. is practically a necessity to obtain concordant results by different analysts. Mixing and quartering on a sampling cloth is not a reliable method of drawing out a sample. No conclusions are drawn as to the satisfactory samplers for stock feed. Further study was recommended on methods for the detn. of cottonseed hulls in cottonseed meal. A method of S. and a gravity method with  $\text{CaCl}_2$  (J. H. Roop) are described.

H. A. LEPPER

Alcohol as a food (ATHANASIU) 11E. The hydrocyanic acid of *Heterodendron* (PETRIE) 11D. Chemical examination of *Macrozamia spiralis* (PETRIE) 11D. Determination of glucose and starch (QUISUMBING) 7. Moisture determination (LIFS-COMB, HUTCHINS) 7. Estimation of phosphatides (BRAUNS, MACLAUGHLIN) 11B. Hydrating anhydrous substances; foods (BRIT. PAT. 149,623) 13.

Evaporated milk. O. W. MOJONNIER. U. S. 1,362,728, Dec. 21. A plurality of samples of milk which have been heated and condensed are, except for a single sample, mixed with varying amts. of  $\text{NaHCO}_3$  to correct for acidity and subjected to a sterilizing treatment at a temp. of  $120^\circ$  for 15 min. in a steam retort with a cage revolving at a speed of 10 r. p. m. The samples are then cooled by blowing off the steam and admitting cold  $\text{H}_2\text{O}$ , the sample is selected showing the best properties for the intended purpose and the main batch from which the samples were derived is then subjected to a treatment corresponding to that given this sample. The process is adapted for producing a smooth product of good viscosity.

Desiccated food from milk curd. P. W. TURNER. U. S. 1,364,417, Jan. 4. A flocculent curd is pptd. by treating milk with rennet or pepsin, further activity of the enzyme is arrested by reduction of the temp. and the product is desiccated by atomizing or spraying *in vacuo* and subjection to air currents.

Desiccating liquids. R. F. BARKER. U. S. 1,362,590, Dec. 21. In desiccating liquids such as milk or cream, the liquid is atomized and partially evapd. in a drying atm., the atomized and partially dried material is collected in a viscous condition on a moving heated surface, further dried on the heated surface to obtain a solid residue and then removed.

### 13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

Canada's growing chemical industry. ANON. *Chem. Age (London)* 3, 456-7 (1920).—The writer touches upon numerous commodities (electrochem. products, org. chemicals, heavy chemicals, fertilizers, hard-wood distn. products, etc.), in drawing

attention to the possibilities and to the development already attained in this field in Canada.

E. G. R. ARDAGH

**Liability in factory management.** DR. STARKLOFF. *Chem.-Ztg.* 44, 929-30(1920).

—The relations between the employee and his employer, the liability of the latter in case of accident, the workers' rights to 8-hr. day and Sunday rest, and the non-employment of minors, are discussed from a legal view-point. The German chem. industry, although highly diversified, has adequate precautions for its employees prescribed for it by the government.

S. D. K.

**Railway carriage of dangerous goods.** ANON. *Chem. Trade J.* 67, 641(1920).

W. H. BOYNTON

**New method for the recovery of volatile solvents.** A. ENGLEHARDT. *Kunststoffe* 10, 194-5(1920).—The vapors are absorbed by highly active charcoal. 1 kg. charcoal may absorb 200 g. ether from a stream of gas. The solvents are removed by means of steam or in a vacuum.

C. J. WEST

**Heating and ventilating chemical plants.** HEINRICH MÜLLER. *Chem.-Ztg.* 44, 925-6(1920).—Radiators, stoves and usual forms of heating app. are at a disadvantage in factories and workrooms because they take up valuable space and are difficult to clean. A combination heating and ventilating system based on the forced circulation of heated air will remove dust, odors, and noxious gases and can be operated economically by waste heat from power plant, exhaust from Diesel motors, electric melting or blast furnaces, and other sources of heat.

S. D. KIRKPATRICK

**The use of autoclaves in chemical processes.** T. CALLAN. *Chem. Age (London)* 3, 502-3(1920).—An address reviewing general points, construction, compn., capacity, and means of charging and heating autoclaves. C. claims that generally safety valves fail to function properly, often causing a false sense of security. It must be possible to relieve a large excess pressure rapidly and without choking by finely divided ejected particles. The continuous tube type consists of a coil of tubing heated by immersion in a suitable heating bath. Such a coil can be made to stand extreme pressures, permitting the use of high temps.

W. H. BOYNTON

**Cooling of water.** H. M. DUNKERLEY. *Chem. Age (London)* 3, 627-8(1920).—D. gives a sketch of the present methods of cooling in the condenser of the steam turbine where a vacuum of 28 in. or better is required, also in various types of refrigerating machines. The essentials in the design of a plant for cooling circulation water are (1) to present the largest possible surface of water, and (2) to pass over the water the largest possible amt. of air.

L. W. RIGGS

**Separation of slimes from liquids by centrifuging.** BERTHOLD BLOCK. Charlottenburg. *Chem. App.* 7, 178-82, 185-9(1920); 8 cuts; cf. *C. A.* 14, 1872, 3505; 15, 403 B. discusses "Extreme division, and the results obtained up to the present with the finest particles," and "Centrifugals with planet motion."

J. H. MOORE

**Some problems of lubrication.** W. B. HARDY. *Nature* 106, 569-72(1920).—A discourse.

W. H. ROSS

**Carbonization of lubricating oils.** ANON. *Bur. Standards, Circ. No.* 99, 44 pp. (1920).—The nature and properties of the deposits formed in internal-combustion engines have been the subject of controversy, which is briefly reviewed. Lab. tests which shall be correlated with this effect have not been entirely satisfactory; the Waters and the Conradson "carbon content" tests are described in detail, however. The percentage of asphalt formed on heating is high in high-sulfur oils, but is also raised by the presence of  $Fe_2O_3$  and other catalyzers. The action of air in direct sunlight is to lower the iodine number, raise the Maumené number, the asphalt and the free-acid content, and lower the demulsibility. The asphalt formed on heating is not related to the flash or fire point, evaporation loss, or viscosity.

W. B. V.

**The theory of gas-scrubbing towers with internal packing.** W. B. VAN ARSDEN.

*Chem. Met. Eng.* **23**, 1115-6(1920).—The equations developed by Donnan and Masson (*C. A.* **14**, 2971) lead to a formula for "mean concn. difference" (or better, mean unsatn. of the liquid phase) analogous to the logarithmic mean temp. difference used in heat-interchanger problems, concn. of the liquid phase at inlet and outlet taking the place of inlet and outlet temp. of the cooler liquid, and concn. of the gas at inlet and outlet times the Henry const. for the liquid and gas in question taking the place of inlet and outlet temp. of the warmer liquid. W. B. V.

**High-speed electric telferage.** HERBERT BLYTH. *Chem. Age (London)* **3**, 532-3(1920); cf. *C. A.* **14**, 3171.—The relation of an electric telfer installation to plant production is considered. The general principles of construction with adaptation to various industries are given. The advantages of a telfer system are that it includes the function of an elevator as well as a conveyor, is practical over tortuous routes, affords easy and complete control, possesses great flexibility, permits weighing of the charge in route and is reasonable in upkeep. R. L. BROWN

**Effect of humidity on leather belting.** F. W. ROYS. Worcester Polytechnic Inst. *Textile World J.* **59**, 201-5(1921).—Stretch of belting is greater for a given change in tension at high humidity than at low with a const. temp., for given change in humidity at const. temp. is greater at high tensions than at low, and is greater for given change in humidity at high temp. than at low. Curves are given. CHAS. E. MULLIN

**Weir measurement of liquids.** L. G. CHASE. *Chem. Met. Eng.* **23**, 1224-6(1920).—Meters are usually attacked by chemicals. Those operated in closed lines with Hg valves fail through the action on Hg. Displacement meters fail. A weir is best but only applicable to measurement of gravity flow. The V-notch type weir is best for small vols. The formula derived by Thompson 60 years ago is still the standard:  $Q$ , the quantity liquid in cu. ft. per min. =  $0.305 H^{3/2}$ , where  $H$  is the height in in. of the liquid passing over a right-angled V-notch. This is also true for a notch of any angle less than a right angle in direct proportion to area. The derivation of the formula is shown. For  $H_2SO_4$  measurement a glass notch is used; for NaOH a steel notch; for milk a tinne metal notch; monel metal is used for some purposes. The Lea recorder, a cont. V-notch meter, is illustrated and described. The recording mechanism shows height of liquid over weir; rate of flow is indicated on a cam drum. A graph shows vol. for any period. It is applicable to  $H_2SO_4$ , caustic alkalies, pyroligneous acid, cyanide solns., bleach, coconut oil, etc. JAS. O. HANDY

Pump for chemical gases and liquids—pneumatic conveying of chemical salts (SIEMENS-SCHUCHERT-WERKE) I.

SCHÜLE W.: *Technische Thermodynamik*. 3rd enlarged Ed. of "Technischen Wärmemechanik," 2nd vol. *Höhere Thermodynamik*. Berlin: J. Springer. 409 pp. M. 36. For review see *Z. physik. Chem.* **96**, 501(1920).

**Magnetic separation of gases.** C. S. PALMER. U. S. 1,364,136, Jan. 4. Gaseous mixts., such as air, one constituent of which is more magnetic than the others are passed partly over and partly through a porous magnetized material such as a perforated soft Fe cylinder and the gases are conducted off in 2 streams from opposite sides of the material to effect a concn. of the more magnetic gas, e. g., O, in one of the streams.

**Recovering volatile solvents.** W. K. LEWIS and W. GREEN. *Brit.* 152,374, Jan. 31, 1919. Clean flue gas is used to vaporize the solvent such as naphtha, benzene, or gasoline from freshly coated fabrics; as by cooling, pressure, absorption, or a combination. A suitable app. is specified.

**Method for the removal of solid nitrogen oxides from refrigeration devices.** EINAR BRAGVE. *Can.* 208,007, Jan. 25, 1921. Solid oxides of N are removed from refrigera-

tion devices in a liquid condition by introducing an oxide of N in a gaseous condition into the space containing the solid oxides to be removed.

**Aerating and cooling liquids.** Soc. DES GAZ RADIOACTIFS NATURELS DE COLOMBIÈRES SUR ORB. Brit. 152,687, Oct. 21, 1920. Liquids are cooled and aerated by immersing in them a device having a perforated bell-shaped head which is filled with solid  $\text{CO}_2$  by pressing it into a mass of  $\text{CO}_2$  snow and is then coated with ice by immersing it in  $\text{H}_2\text{O}$  cooled almost to the f. p.

**Hydrating anhydrous substances; salts, obtaining in special forms; soaps; food preparations; coffee preparations; dyes.** A. WELTER. Brit. 149,623, July 26, 1920. Finely divided solid substances are treated while in motion with a fine spray of a liquid for various purposes. The solid is dispersed in the form of a cloud or mist and is mixed with the sprayed liquid. The moistened particles then fall, it may be against a stream of air which may effect drying of the particles, a non-caking product being obtained. Anhydrous  $\text{Na}_2\text{CO}_3$  may be thus treated with a spray of oleic acid to form a soap powder containing  $\text{NaHCO}_3$ ; or the oleic acid may be used in admixture with  $\text{H}_2\text{O}$  or soap soln. Unstable or hygroscopic salts may be coated with a spray of Na silicate, the substances mentioned being  $\text{Na}_2\text{S}_2\text{O}_3$  and persalts such as Na perborate. Anhydrous "sulfuric sodium oxide" may be hydrated by a water spray, forming fine crystals of Glauber's salt. Milk may be sprayed, together with sugar or flour, and coffee or coffee powder may also be treated. A coal-tar dye melted with dextrin and afterwards pulverized may be sprayed with wood spirit or  $\text{EtOH}$ , the product being particles coated with a film of dye. It is stated that the process in which a drying effect is produced can be combined with other operations such as coloring, impregnating, sugaring, disinfecting, or sterilizing of the material treated.

**Utilizing exhaust gases from internal-combustion engines for calcining or other heating operations.** L. E. TISSIER. U. S. 1,364,656, Jan. 4. Mineral or vegetable substances such as gypsum, sulfides, wood or peat are subjected to the direct action of exhaust gases from internal-combustion engines, in order to effect calcination, roasting, drying or carbonization.

**Purifying used lubricating oil.** C. H. HAPGOOD. U. S. 1,363,784, Dec. 28. Used crank case oil is treated with a saponifiable oil such as "red oil" and the mixed oils are then treated with an alkali such as  $\text{Na}_2\text{CO}_3$  to saponify the saponifiable oil and facilitate the sepn. of the oil from C and other impurities.

**Composition for sealing piston rings.** J. W. CALTA. U. S. 1,363,563, Dec. 28. A lubricating paste adapted for sealing piston rings is formed of soapstone 30, mica 30, asbestos fiber 20, flake graphite 10, fine "plumbago" 10 parts and mineral oil in sufficient amt. to form a pasty mixt.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Gases dissolved in water.** J. H. COSTE. *Chem. Age (London)* 3, 447(1920); *Chem. News* 121, 265-8(1920).—A résumé is presented of well established facts in the light of reaction between heterogeneous phases, discussing: the limit of soly. of N, O,  $\text{CO}_2$  and A; the Winkler method for detg. O and N; titration of  $\text{CO}_2$  and  $\text{HCO}_3$  with  $\text{Na}_2\text{CO}_3$  in presence of phenolphthalein and other indicators with buffer mixts.; the activity of O and  $\text{CO}_2$  in stream purification and as geological agents; and practical application of gases in sewage purification, and their removal from boiler feed waters.

W. F. MONFORT

**The boiler-water softening compound "kespurit."** COSLICH. Berlin. Z. *Spiritusind.* 43, 243-3(1920).—A three-month test of "kespurit" in water of 33.5° hardness showed that the scale-forming materials were precipitated as a fine powder,

which was blown down every day, no adherent scale and no corrosive salts being formed. The quantity necessary was 5 g. "kespurit" per cu. m. of water per degree of hardness.

W. B. V.

**Sterilization of water by chlorine gas.** J. STANLEY ARTHUR. *Engineering* 110, 694-6, 716-21 (1920).—Various types of app. for water sterilization, especially portable forms for the English military forces, are described in detail, with data of exptl. work. Discussion by eminent sanitarians developed much historical matter on early app. and methods of overcoming tastes through dechlorination.

W. F. MONFORT

**Treating sewage by the Dorr system.** R. H. EAGLES. *J. Boston Soc. Civil Engineers* 7, 245-68 (1920); *Pub. Works* 50, 52-6 (1921).—A description of the settling basins of the Dorr type, circular and shallow, with a slowly rotating squeegee to move settled solids or sludge to the center, for removal. This type has been applied in treating trade wastes. The Dorr-Peck activated-sludge tank is also described, a double deck type with a settling basin above and an aerating chamber below, for which the use of 0.6 cu. ft. of free air per gal. of domestic sewage is claimed, with detention period of 8 to 10 hours. Analytical data are given and application described.

I. P.

#### Corrosive value of waters (THIBAUT) 9.

**Apparatus for purifying water by treatment with ozone.** H. B. HARTMAN. U. S. 1,363,589, Dec. 28. The app. comprizes a storage reservoir, an ozone generator and an automatic regulator which synchronously controls the flow of raw water and ozone to the reservoir.

**Apparatus for water purification.** J. W. ELLMS. U. S. 1,362,611, Dec. 21. The app. is especially adapted for rapid chem. treatment of water in large quantities.

**Water-softening apparatus.** J. E. CAPS. U. S. 1,362,673, Dec. 21. The app. is adapted for the treatment of H<sub>2</sub>O with zeolites in the form of a filter bed.

**Filter for water.** W. G. LINDEMANN. U. S. 1,362,998, Dec. 21.

**Apparatus for ozonizing water.** W. G. LINDEMANN. U. S. 1,362,999, Dec. 21.

**Treating sewage.** J. P. BALL. U. S. 1,364,676, Jan. 4. Sewage carrying sludge is subjected to the action of a current of air to withdraw noxious gases with entrained particles of sewage, and the sewage-laden gases are discharged through a baffle chamber to sep. entrained matter.

**Treating sewage.** C. P. LANDRETH. U. S. 1,364,387, Jan. 4. Air is passed through sewage and the latter is treated with Ca(OH)<sub>2</sub> or similar reagent to cause the formation of a sediment or sludge. The sludge is withdrawn, mixed with a germicide and dewatered. CaCO<sub>3</sub> or MgCO<sub>3</sub> may be added. The solid product is suitable for use as a fertilizer.

### 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**The evolution of agriculture.** ALBERT BRUNO. *Chimie & industrie* 4, 673-7 (1920).—A brief, general review of the progress in our understanding of the phenomena which take place in various agricultural and allied processes due to discoveries in chemistry and biology during the last 100 yrs. or so; action of fertilizers (including CaO and other minor constituents of the soil), reaction of soils, methods of cultivating, functions of bacteria and protozoa, action of chemicals on bacteria and parasites, function of amino acids in nutrition, vitamins.

A. P.-C.

**P. S. U. Pickering.** E. J. RUSSELL. *J. Soc. Chem. Ind.* 39, 448R (1920).—An obituary.

E. H.

**Physico-chemical studies on soil.** The colloidal function in the soil and the prop-

erties dependent upon it. U. PRATOLONGO. *Staz. sper. agrar. ital.* 53, 5-23(1920).—The problem of the analytical detn. of the sum of the colloidal constituents of a soil has been variously investigated and solved but the solns. proposed suffer from the character of relativity which is peculiar to the very concept of colloid so that the investigations have taken no account of the necessity of defining in the first place the "colloidal function" to which the measure of the colloidal constituents to be detd. refers. If in a certain sense and by convention it is assumed that the wt. of such constituents can represent the measure of them it is known on the other hand that the "colloidal function" which it is really a matter of importance to measure has no relation whatever to the mass of the colloidal substance on which it depends: the mass of the colloidal constituents of the soil can in fact remain const. while the colloidal function undergoes noteworthy variations, whether through phys. causes such as heating and freezing or by chem. causes as the addition of acids, bases or org. substances. In a colloid subjected to gradual desiccation the aq. vapor tension shows correspondingly decreasing values with decrease in the moisture content of the colloid itself. When a definite moisture content is reached, however, the curve ceases to be continuous and the tension decreases with decreasing moisture content according to a new function. P. has shown (*Staz. sper. agrar. ital.* 46, 219(1913)) that this phenomenon is also shown by soils in consequence of the presence of colloids and with such uniformity of character as to permit of a simplification in the exptl. method for the detn. of the isotherms of vapor tension. The vapor tension at which this discontinuity (the "transition" or v. Bemmelen's "Umschlag") is shown has a const. value, 2.2 mm. Hg. Ten g. of air-dried soil are placed in a vacuum desiccator over  $H_2SO_4$  of sp. gr. 1.54 (corresponding to an aq. vapor tension of 3.0 mm. Hg at  $25^\circ$ ) and the desiccator itself kept in a thermostat at  $25-30^\circ$  for 2 days. Equil. between the soil moisture and the vapor tension of the desiccator is ascertained by weighing the soil at intervals of a day till its wt. is const. The moisture in the soil when this point is reached represents the position of v. Bemmelen's "transition." This moisture is detd. by the loss in wt. obtained on placing the soil in a vacuum desiccator over  $H_2SO_4$  of sp. gr. 1.84, whereby complete desiccation is secured at a temp. of  $25-30^\circ$  in 1 day (as shown by const. wt. reached). Detns. of the position of v. Bemmelen's "transition" were made on 12 soils the phys. and chem. characteristics of which are given in a table in detail. The results when compared with the phys.-mechanical properties show as great a variability as the variability of the data of the phys.-mechanical analyses. If the position of v. Bemmelen's "transition" is assumed a measure of the colloidal constituents of the soil—which can be justified—no other relationship is disclosed between the content of true colloids and the data of phys.-mechanical analyses as carried out by ordinary procedures. A more extensive and precise investigation of the problem by forcing the sepn. of the phys.-mechanical constituents of the soil to the extreme limits of sepn. permitted by the nature of the method itself was undertaken according to P.'s densimeter method (*Staz. sper. agrar. ital.* 50, 117-56(1917)), but an attempt to correlate the physico-mechanical constitution of the soil as given by these results with the position of v. Bemmelen's "transition" showed that the two data are not bound by any relationship. The effect of heating the soil in a steam oven at  $100^\circ$  for 3 hrs., in an air oven at  $150^\circ$  for 3 hrs. or of freezing it, previously moistened with a little  $H_2O$ , at  $-5^\circ$  on the position of v. Bemmelen's "transition" is shown in the following:

	Soil I.	Soil II.	Soil III.
	%	%	%
Original soil .....	2.32	2.5	1.4
Soil heated 3 hrs. at $100^\circ$ .....	1.89	1.82	1.12
Soil heated 3 hrs. at $150^\circ$ .....	1.42	1.37	0.52
Soil frozen.....	1.85	2.03	1.13

The sensitiveness of the "transition" to heating and freezing is greater than that shown by any other property.

ALBERT R. MEEZ

**Determination of moisture in field samples of soil.** H. A. NOYES AND J. F. TROSY. Agr. Expt. Sta., LaFayette, Ind. *J. Assoc. Off. Agr. Chem.* 4, 95-8(1920).—Soil for moisture detn. should weigh at least 10 g. for accurate detn. The amt. of  $H_2O$  in the soil affects the results as well as the physical character of the soil. R. F. C.

**Relation of the soil solution to the soil extract.** D. R. HOAGLAND, J. C. MARTIN AND G. R. STEWART. *J. Agr. Research* 20, 381-95(1920).—As indicated by the f. p. method seasonal studies on cropped and uncropped soils show that water exts. give a true index of the soil mineral constituents. Various methods of making water exts. are compared. In seasonable studies exts. should be made with the smallest proportion of water to soil practicable, and with sufficient time for thorough admixture. One part of soil to one of water was found satisfactory. It is stated that "soil ext. is composed chiefly of the solutes present in the soil soln. plus substances dissolved from 'absorbed' or easily sol. components of the soil. This latter fraction of soil ext. is dependent in part on the concn. and compn. of the soil soln. since the solutes of the latter exert a depressing effect on the soly. of certain soil constituents." Data are presented which seem to justify the conclusion that in a concd. ext. the relation between the various elements may be very similar to that existing in the soil soln. It was found that the soil soln. fluctuates in compn. and concn. with every environmental change and crop growth.

J. J. SKINNER

**Correlation work in peat land problems.** A. P. DACHNOWSKI. *Bot. gaz.* 70, 453-8(1920).—A discussion of the correlation which exists between the botanical compn. of different types of peat material and its corresponding physical, chem., bacteriological, or other merits. (See also *C. A.* 14, 917.)

BENJAMIN HARROW

**Number of colonies for a satisfactory soil plate.** H. A. NOYES AND G. L. GROUNDS. *Proc. Indiana Acad. Sci.* 1918, 93-101.—Counts made after 3, 7 and 10 days' incubation at 20° showed that 30 colonies was the optimum number for a Petri dish of 100 mm. diam. The most satisfactory number for computing bacterial counts was 10-100 colonies per plate.

F. M. SCHERTZ

**The length of time to incubate Petri dishes.** H. A. NOYES, EDWIN VOIGT AND J. D. LUCKETT. *Proc. Indiana Acad. Sci.* 1918, 102-9.—Moisture, aeration and soil temp., as well as the type of soil, vary the rapidity with which bacteria develop into colonies. When the number of colonies per plate is small enough for all organisms to develop into colonies, counts made after 10 days' incubation at 20° gave reliable results as to the bacterial content of the soil.

F. M. SCHERTZ

**Bacteria in frozen soil.** H. A. NOYES. *Proc. Indiana Acad. Sci.* 1918, 110-6.—The data reported do not prove that the number of bacteria present in soil is increased when the soil is frozen.

J. J. SKINNER

**Analysis of one hundred soils in Allen County, Indiana.** R. H. CARR AND V. R. PHARES. *Proc. Indiana Acad. Sci.* 1918, 151-65.—The N and P content of the samples are given. Eleven % of the soils analyzed have less than 4% org. matter, 45% range from 4% to 7%; 37% range from 7% to 15% and 6% of the soils examined are above that amt. Each % of increase in org. matter carried with it an increase of 519 lbs. of N and 72 lbs. of P per acre. Fifty-five % of the soils are acid.

J. J. SKINNER

**The biological method of determining the fertilizer requirement of a particular soil crop.** R. P. HIBBARD AND S. GERSHBERG. *Michigan Acad. Sci., Rept. No.* 21, 223-4(1919).—The triangular system devised by Schreiber and Skinner (*C. A.* 12, 2398), using the fertilizer salts, acid phosphate,  $NaNO_3$  and  $K_2SO_4$ , is used for detg. the fertilizer requirement of soils.

J. J. SKINNER

**Effect of calcium sulfate on soils.** M. M. MCCOOL. *Mich. Agr. Expt. Sta., Quart. Bull.* 2, 97-9(1919); cf. *C. A.* 14, 2525.—A report on the effect of the addition

of  $\text{CaSO}_4$  to silt loam, heavy sand, fine sandy loam, very fine sand, heavy silt loam and silt loam soil well supplied with org. matter. Washings from the soils when analyzed showed that the addition of the sulfate resulted in a decrease in the amt. of sol. silica, except in two cases. Two of the soils which were washed a second time showed less P in soln. than did the corresponding untreated soils. Three of the soils that were washed 15 days after the first period contained less sol. Mg than the unwashed samples. One negative result was found with Na, two with Fe and three with Al. Effect of the sulfate on the rate of formation of potash was slight.

F. M. SCHERTZ

**Cause of lime-induced chlorosis and availability of iron in the soil.** P. L. GRASS AND J. D. CARRERO. *J. Agr. Research* 20, 33-61(1920); cf. *C. A.* 14, 2009.—A general review and a discussion of the literature is given. It is concluded that the wt. of evidence from ash analysis of chlorotic plants seems to point to a deficiency of Fe in the ash as being one cause of the chlorosis with possibly an excess of Ca as a contributory cause. Treatment of chlorotic plants with Fe shows that lack of Fe is one of the causes. Different lime compds. affected plants differently. The chlorosis of some plants is evidently associated with the presence of  $\text{CaCO}_3$  in the soil; however, there was no evidence of a general lack of lime in inducing chlorosis. Rice, one of the plants sensitive to lime, does not appear to be sensitive to the alkalinity of  $\text{CaCO}_3$  except as the alkalinity influences the availability of Fe. A number of pure org. Fe compds. proved to be inefficient sources of Fe for rice in calcareous soils. The availability of Fe compds. in calcareous soils appears to be slightly greater near the optimum  $\text{H}_2\text{O}$  content of the soil than with excess water. Rice will grow in submerged calcareous soils without becoming chlorotic.

J. J. SKINNER

**A field comparison of hydrated lime with limestone of different degrees of fineness.** BURT L. HARTWELL AND S. C. DAMON. Rhode Island Agr., Expt. Sta. *Bull.* 180, 4-18(1920).—A slaked lime containing 50.99%  $\text{CaO}$  and 22.43%  $\text{MgO}$  and a ground limestone containing 56.3% particles passing an 80-mesh sieve, 12.5% passing between 80 and 40 mesh, 19.4% between 40 and 20 mesh, and 11.8% between 20 and 10 mesh, were used. The results for mangels, carrots, alfalfa, and barley grown on their respective plats show that "where much lime is needed about 2.5 parts in weight of ground limestone, depending upon its fineness, is required to exert the same first effect as one part of hydrated lime," while a selection from the two kinds of lime should depend mainly on the rel.  $\text{CaO}$  equivalent delivered on the land.

R. F. GARDINER

**Additional information concerning lime.** M. M. MCCOOL. Mich. Agr. Expt. Sta., *Quart. Bull.* 2, 95-7(1919).—Few of the surface soils of Michigan, aside from those deposited in former lakes, contain  $\text{CaCO}_3$  except in the form of rather large fragments. Exptl. field projects on the use of lime on acid soils indicate that often returns from the first crop of the soils limed pay for the cost of application. Ground limestone and hydrated lime were quite active in increasing the availability of Ca, Na, Mg, S and  $\text{P}_2\text{O}_5$ . Lime has little, if any, effect on the leaching of potash from soils.

F. M. SCHERTZ

**The effect of mass and degree of fineness on the percentage of available phosphoric acid in precipitated phosphate.** H. D. HASKINS. Agr. Expt. Sta., Amherst, Mass. *J. Assoc. Off. Agr. Chem.* 4, 64-5(1920).—Expts. were made to det. the soly. of pptd. tri-Ca phosphate prepd. by treating phosphoric acid, obtained in the manuf. of glue, with slaked lime, in specially prepared ammonium citrate soln. It was found that there were limits to the yields of available phosphoric acid depending upon the degree of fineness of the material. A 1-g. sample gave higher yields of available  $\text{P}_2\text{O}_5$  than a 2-g. sample, owing to the high state of satn. of the citrate soln. obtained with the use of the latter.

R. F. GARDINER

**The solubility in citric acid of the phosphoric acid in Thomas and Martin phosphate slags.** AUGUST KAYSSER. *Chem.-Ztg.* 44, 826(1920).—The quicker the cooling of



the slag the smaller is the number of crystals of tetraphosphate formed and the more sol. is the slag in citric acid. The question arises whence comes the CaO necessary for the formation of tetraphosphate from the tribasic phosphate? This "excess" CaO arises from the so-called free CaO not combined with  $P_2O_5$ ,  $SiO_2$  or  $Al_2O_3$ . The surplus CaO (that not necessary for the formation of tribasic phosphate) might first be combined with  $SiO_2$  in the furnace. Upon slow cooling the  $SiO_2$  combines with the Fe and Mn, setting free the CaO. This explains why the sesquioxides reduce the soly. in citric acid. Sudden cooling does not permit the sepn. of the  $SiO_2$  and the CaO. Free CaO always decreases in slowly cooled slag with an Fe content of 4-6% but with one containing 10% or more Fe it is decidedly increased since in spite of its consumption for the formation of tetrabasic phosphate more CaO is set free by the sesquioxides. The addition of  $SiO_2$  to Thomas slag in order to increase its citric acid soly. is only for the purpose of binding the free CaO. The fact that citric acid soly. disappears practically completely on addition of fluorspar is due to the addition of more CaO and apparently also to the decrease of  $SiO_2$  by volatilization. "Perhaps the nascent state may also have significance here."

ALBERT R. MERRZ

The relation of nitrogen, phosphorus and organic matter to corn yield in Elkhart County, Indiana. R. H. CARR AND LEROY HOFFMAN. *Proc. Indiana Acad. Sci.* 1918, 160-5.—The soils were found to be low in org. matter and 50% were acid. Crop yields bear a close relation to the org. matter present and this in turn is closely associated with the amts. of N and  $P_2O_5$  present. Each increase of 2,672 lbs. of org. matter, 71.6 lbs. of N and 35.7 lbs. of  $P_2O_5$  per acre showed an increase of 1 bu. of corn. Some farms showed that good crops are not always obtained from soil which had the required amts. of plant food present. The difference in yield of soils which contained 0.2% and 8-10% of org. matter was 25.6 bushels.

F. M. SCHERTZ

The effect on the growth of rice of the addition of ammonium and nitrate salts to soil cultures. S. F. TRELEASE AND PEDRO PAULINO. *Philippine Agriculturist* 7, 293-313(1920).—Rice was grown in cultures containing water-satd. soil to which P, K and N were added in various proportions. The scheme of prep. solns. and presenting results is based on the triangular diagram (C. A. 12, 2398). Each culture was supplied with a 3-salt mixt. composed of  $CaH_4(PO_4)_2$ ,  $K_2SO_4$  and a nitrogenous salt. Four N salts were used  $((NH_4)_2SO_4$ ,  $NH_4NO_3$ ,  $Ca(NO_3)_2$  and  $NaNO_3$ ). Cultures having a high proportion of N produced the largest yield; the exact ratio of P, N, and K varied slightly with the N salt used. The best cultures supplied with  $(NH_4)_2SO_4$  gave a yield approx. 9.6 times the yield of the control, the  $NH_4NO_3$  6.5 times, and  $Ca(NO_3)_2$  and  $NaNO_3$  about 3 times greater than the control.

J. J. SKINNER

The growth of rice as related to proportions of fertilizer salts added to soil cultures. SAM F. TRELEASE. *Coll. Agr. Los Baños. Philippine J. Sci.* 16, 603-27(1920).—Rice was grown in large pots of clay loam soil, which was kept flooded. Varying amts. of the salts  $Ca(H_2PO_4)_2$ ,  $(NH_4)_2SO_4$  and  $K_2SO_4$  were added to each of the 36 pots. The best results as indicated by dry wt. of grain, dry wt. of tops, and number of panicles were obtained with the largest amts. of  $(NH_4)_2SO_4$  and the smallest amts. of the other salts.

T. G. PHILLIPS

Hydrocyanic acid derivatives as insect destroyers. F. FLURY AND A. HASE. *Munch med. Wochschr.* 67, 779-80(1920).—The action of  $CNCl$ ,  $CNBr$  and  $CNCOOCH_3$  on cats and mice was compared with HCN on cats and mice in the gas chamber. These compds. were very toxic, not much less so than HCN at a concn. of 1 mg. per liter. In concns. in which HCN is no longer toxic for cats  $CH_3COOCH_3$  may produce severe lesions. This compd. is a colorless very volatile liquid, b. 96-97°. The Et ester is not as active. "Cyklon" is a commercial prepn. containing both Me and Et esters and 10% of the highly irritable Cl ester. The action of cyklon on various insects was tested (including bedbugs and cockroaches) in various concns. It possesses the

advantages of HCN and in addition, when present in dangerous concns., it betrays itself by its irritative effect on the mucous membranes of eyes, throat and nose. Green plants are killed as with HCN. Wheat kernels retain their germinating power.

S. AMBERG

Daylight orchard fumigation. R. S. WOGLUM and M. B. ROUNDS. U. S. Bur. Entomology. *J. Econ. Entomology* 13, 476-85(1920).—In winter, daylight fumigation of citrus trees with liquid HCN is preferable to night fumigation because the insects are more resistant to the gas on cool nights. The trees are less liable to injury when in the dormant conditions, as they are in the winter. Expts. with daylight fumigation during the growing season gave some success but cannot yet be recommended in practice. Cf. C. A. 13, 1512, 2954; 14, 3494, 3746.

CHAS. H. RICHARDSON

Notes on the U. S. Government method of determining phenols in sheep dips. K. B. EDWARDS and G. A. FREAK. *J. Soc. Chem. Ind.* 39, 328-7T(1920); cf. C. A. 3, 590.—Investigation of com. creosote oils or cresylic acids to ascertain whether the coeff., wt. of phenols divided by increase in vol. of NaOH, which is used in the method showed a large or negligible variation gave the results:

	Coeff.			Apparent % phenols taking coeff. as 1.
	I.	II.	Mean.	
Phenol.....	1.081	1.075	1.078	92.7
o-Cresol .....	1.058	1.064	1.061	94.2
m-Cresol .....	0.995	0.990	0.992	100.7
p-Cresol.....	0.971	0.980	0.975	102.5

These show that the nature of the phenol is all-important, phenol showing an excess of 8% and *p*-cresol a deficiency of 2.5%. Com. cresylic acid was purified by soln. in NaOH, distn. with steam to remove neutral oils and bases and recovery of the phenols by treatment with acid. Fractions of the phenols were obtained by distn. and also a portion of the acid was completely distd. until decompn. commenced, the product being designated as "complete mixed distillate." The results obtained from these were:

Fraction.	Coeff.	Apparent % of phenols (coeff. 1).
Below 195°.....	1.052	95.0
195-197°.....	1.042	96.0
197-200°.....	1.026	97.5
200-205°.....	1.015	98.5
205-215°.....	0.990	101.0
215-225°.....	0.948	105.5
225-235°.....	0.922	108.5
235-250°.....	0.900	111.5
Above 250° (to about 300°).....	0.851	117.5
Complete mixed distillate.....	0.985	101.5

The coeff. is less for the higher-boiling compds. as before and it is therefore obvious that the method is open to serious objection as a low-boiling acid, which will contain a large proportion of phenol and *o*-cresol, may yield results considerably below the truth. There is very great need for a simple and accurate test for the detn. of the purity of cresylic acids.

ALBERT R. MERRZ

Dipping tobacco plants at transplanting time for the control of the tobacco flea beetle (*Ephitrix parvula* Fabr.). Z. P. METCALF. N. C. State Coll. and Expt. Sta. *J. Econ. Entomology* 13, 398-400(1920).—Dry Pb arsenate 1 lb. in 10 gals. H<sub>2</sub>O was found to be an effective insecticide for this insect.

C. H. R.

Control of the potato leafhopper (*Empoasca mali* LeB.) and prevention of "hopper burn." JOHN E. DUDLEY, JR. U. S. Bur. Entomology. *J. Econ. Entomology* 13,

408-15(1920).—Kerosene emulsion, nicotine sulfate, Bordeaux mixt., and Bordeaux mixt. + nicotine sulfate were used in these expts. The last named mixt. gave the best results as shown in the yield of potatoes per acre, but Bordeaux mixt. alone gave nearly as good results. Kerosene emulsion gave the poorest results. C. H. R.

**The squash bug.** F. M. WADLEY. U. S. Bur. Entomology. *J. Econ. Entomology* 13, 416-25(1920).—This is a life history of *Anasa tristis* DeGear with methods for its control. A spray mixt. containing 0.25 lb. fish oil soap and 2 oz. sulfur (flowers) gave the most promising results of the materials tested. C. H. R.

**Petroleum insecticides.** ROBERT K. VICKERY. Calif. Spray Chem. Co. *J. Econ. Entomology* 13, 444-7(1920).—In this article, brief consideration is given to the more important recent studies on the toxicity of petroleum to insects. Some new observations are given on the effect of gasoline vapor on the enocytes, cells found in the blood of insects. The author believes that compds. of particular value as insecticides may be found in petroleum oils. However, a closer study of the physiol. action of petroleum on insects should first be made. A bibliography of 12 titles concludes the article. CHAS. H. RICHARDSON

**Some studies on the effect of arsenical and other insecticides on the larvae of the oriental peach moth.** ALVAH PETERSON. N. J. Agr. Expt. Sta. *J. Econ. Entomology* 13, 391-8(1920).—Spray mixts. of Pb arsenate, Ca arsenate, Mg arsenate, Zn arsenite and Paris green, with or without casein-lime as a spreader, when applied to peach twigs did not prevent the larvae of the oriental peach moth (*Laspeyresia molesta*) from burrowing into the twigs. Hellebore, nicotine, nicotine resinate, crude phenol, lime-sulfur and several proprietary preps. were also ineffective. Similar results were obtained with a number of insecticides applied to the twigs in finely powdered form. The smaller larvae were killed when placed upon immature peaches which had been sprayed or dusted with Pb arsenate. Cf. *C. A.* 14, 3746. C. H. R.

**The prevalence of *Pegomya hyoscyami* Panz.** FR. RAMBOUSEK. *Listy Cukrodr* 38, 369(1920).—R. briefly discusses methods for curbing this extremely destructive sugar beet pest. JOHN M. KRNO

**Destruction of the field mouse by means of sulfur dioxide.** HENRY SAGNIER. *Compt. rend. agr. France* 60, 882-884(1920).—SO<sub>2</sub> is injected into the holes under its own pressure. 0.45 g. is required per hole, 3000 holes can be treated in 6 hrs. and the number of holes may even reach 80,000 per hectare. F. M. SCHERTZ

Determination of water-soluble potash in wood ashes and treater dust (HASKINS)  
7. Moisture determination (LIPSCOMB, HUTCHINS) 7. Treating sewage (fertilizer) (U. S. PAT. 1,364,387) 14. Utilization of peat (fertilizer) (CAN. PAT. 207,257) 21. Protecting nichrome tubes used at high temperatures (U. S. PAT. 1,363,428) 9.

**Fertilizer.** E. H. RICHARDS and H. B. HUTCHINSON. Brit. 152,387, June 14, 1919. N in an insol. form is recovered from dil. solns. of sol. N compds., such as sewage or solns. of NH<sub>3</sub> salts, by maintaining the soln. under aerobic conditions in contact with activated carbonaceous material such as straw, dead leaves or bracken. The soln. may be allowed to percolate through the straw or the two may be subjected to air under pressure. The carbonaceous material is activated by being kept in contact under aerobic conditions with a dil. soln. of N compds. for a sufficient length of time, e. g., 90 hrs. The insol. N compds. resulting from the treatment are retained by the carbonaceous matter, the product being available as fertilizer either directly or after storage.

**Cyanamide; fertilizers.** SOC. L'AZOTE FRANCAIS. Brit. 151,989, Oct. 4, 1920. CaNCN is mixed with an agglutinant, such as a gelatinous substance derived from seaweed, and with H<sub>2</sub>O, with or without kainite, and intimately mixed or ground to-

gether to a pasty mass which is then formed into granules and dried. Alternatively, the CaNCN may be formed into granules with H<sub>2</sub>O only, with or without kainite.

**Potassium salts; fertilizers.** G. A. BLANC and F. JOURDAN. Brit. 152,026, Oct. 6, 1920. Leucite is ground to an impalpable powder, preferably after first calcining alone or in presence of superheated steam, lime, or MgO, and the potash is then sol. in dil. acids such as HOAc, HCOOH, citric, (HOCO)<sub>2</sub>, and CO<sub>2</sub> so that it may be used as a fertilizer. The potash may be extd. wholly or in part by treating in an autoclave with CO<sub>2</sub> or with one of the org. acids mentioned at raised temp. and pressure. The product is leached to ext. the K salt, and the residue, if it still contains K, may be used as a fertilizer.

## 16—THE FERMENTATION INDUSTRIES

H. S. PAINE

The action of phosphates in alcoholic fermentation. E. GARINO-CANINA. *Staz. sper. agrar. ital.* 53, 67-78(1920).—As culture medium there was used 100 g. sucrose, 0.25 g. MgSO<sub>4</sub>, 3 g. tartaric acid, 0.1 g. CaCl<sub>2</sub>, 1.5 g. K<sub>2</sub>CO<sub>3</sub>, 2.5 g. asparagine, 0.75 g. K<sub>2</sub>SO<sub>4</sub>, and distd. H<sub>2</sub>O to 1000 g. Before addition of the K<sub>2</sub>CO<sub>3</sub> (an excess of K was used to assure that the action of the K<sub>2</sub>HPO<sub>4</sub> was due to P and not to K) the liquid was heated on the water bath to invert the sugar. After filtration and subdivision into aliquots of 200 cc. in previously sterilized flasks graduated amts. of K<sub>2</sub>HPO<sub>4</sub> were added. The flasks were plugged with cotton, sterilized in live steam and kept 48 hrs. at 24° to absorb O and to control the sterility, then sown with 1 cc. of a homogeneous suspension of *Saccharomyces* previously washed by decantation with sterile H<sub>2</sub>O, placed in a thermostat at 24° for 12 hrs. to the commencement of fermentation, closed with H<sub>2</sub>SO<sub>4</sub> traps which prevented evapn. but permitted escape of CO<sub>2</sub>, and the wt. detd. each day (11 days) after agitation. The variations in wt. indicated variations in intensity of the fermentative process. The mol. concns. of PO<sub>4</sub> used were: (1), 0.00; (2), 0.000052; (3), 0.000104; (4), 0.00052; (5), 0.0052; (6), 0.0104; (7), 0.036. After cessation of fermentation the contents were filtered on tared filter papers, the filtrates brought to original 200 cc. and analyzed and the *Saccharomyces* washed, dried at 100° and weighed. These wts. indicated the power of multiplication with respect to the compn. of the medium. P even in the smallest amts. has a decided effect on the development of the *Saccharomyces*. The max. effect is reached with a concn. 0.0104 mol. The final results were:

	1.	2.	3.	4.	5.	6.	7.
Total CO <sub>2</sub> , % by wt. ....	0.6	4.6	4.5	4.6	4.6	4.6	4.6
Alc., by vol. % .....	0.7	5.70	5.75	5.75	5.70	5.75	5.70
AcOH, % by wt. ....	0.048	0.078	0.067	0.080	0.074	0.072	0.084
Yeast dried at 100° .....	0.051	0.190	0.191	0.245	0.261	0.305	0.300

The increase in volatile acid where phosphates are added has previously been noted by H. Astruc (*Rev. viticulture*, 1911). Fermentation expts. carried out with a prepared pure yeast gave the following results, 10 g. yeast containing 75-80% H<sub>2</sub>O being added to 400 cc. 10% sucrose soln:

Mol. concn. of PO <sub>4</sub> .	Fermentation commenced—min.	30 min.	60 min.	90 min.	120 min.
0.00	53	360	675	1000	1850
0.0028	18	115	250	450	690
0.0056	15	95	265	540	815
0.0112	9	55	175	385	650
0.0563	45	280	600	985	1300

The fermentation is quant. and inversely proportional to activation. Expt. 1 gave the greatest development of CO<sub>2</sub> but lasted 2 hrs. 53 min. 0.5% toluene had a slight

depressive action on fermentation. Similar expts. were made with "Dauerhefe" prepared according to J. Wohlgemuth (*C. A.* 7, 3350) with the results:

	Mol. concn. PO <sub>4</sub>	Fermentation commenced—min. 30.		CO <sub>2</sub> (cc.) 60.	CO <sub>2</sub> (cc.) 90.	120 min.
1 g. enzyme, 10 cc. H <sub>2</sub> O ...	0.0112	35	3.0	5.0	7.0	8.40
1 g. enzyme, 10 cc. H <sub>2</sub> O ...	0.00	60	3.0	5.2	7.5	10.5
2 g. enzyme, 10 cc. H <sub>2</sub> O ...	0.0112	45	3.4	6.5	10.0	12.8

a 10% sucrose soln. being used as before. To lack of phosphates may be ascribed certain failures to secure pressure and effervescence in effervescing wines ("spumanti").

ALBERT R. MREZ

**The action of oxygen on the must of red grapes.** ANDRÉ PIEDALLU, PHILIPP MALVEZIN AND LUCIEN GRANDCHAMP. *Compt. rend.* 171, 1230-1(1920).—The must of red grapes may be decolorized rapidly by bubbling through it pure O, very finely divided by forcing through a porcelain candle. The liquid becomes brown, the coloring matter is pptd., and the filtrate is yellow, hardly tinged with red. T. G. PHILLIPS

**A pseudo-tannin obtained from sorghum.** A. STADNIK. *Chem. Listy* 14, 140-2 (1920).—The use of sorghum as a substitute in the manuf. of beer caused many difficulties. The starch hydrolyzed very slowly and produced an opalescent wort and beer. S. found that this was due to the action of the tannin compds. in the hulls upon the albumins of the wort, forming imperfectly coagulating substances. An ether ext. of these hulls furnished a red dye, insol. in water, sol. in ether, alc., and alkali. In a dry state the color was reddish to brown. On further extn. with hot alc. the hulls yielded an unstable tannin substance which partially decompd. during the process. On evapg. the solvent a reddish brown residue was obtained. After washing with water and drying, a powder was left which was sol. in alc., ether and alkali. The water ext., the decompn. product, and both the alc. and alk. soln. of the color gave similar reactions, as follows: a dull brown coloration with FeCl<sub>3</sub>, yellow with Pb(C<sub>2</sub>H<sub>3</sub>O<sub>4</sub>)<sub>2</sub>, green with Cu(C<sub>2</sub>H<sub>3</sub>O<sub>4</sub>)<sub>2</sub>, yellow to orange with uranyl acetate and with (NH<sub>4</sub>)<sub>2</sub>MoO<sub>4</sub>, and brown with cinchonine sulfate. The aq. soln. of the tannin substance did not ppt. gelatin, hence should not be considered a true tannin. The color probably belongs to the phlobaphene class.

JOHN M. KRNO

Use of "cipollaccio" for food and the production of alcohol (PANTANELLI) 12.

**Acetone; butyl alcohol.** C. WEIZMANN. *Brit.* 150,360, May 25, 1917. In fermenting mashies prepd. from nuts or fruits which contain starch together with saponins or other froth-producing materials, such as chestnuts or horse chestnuts, to produce acetone and butyl alc. as described in 4,845, 1915, the mash is treated with malt to prevent frothing during fermentation. The nuts, which may be whole or may be shelled and divided, are mashed at a temp. of 120-130°, the mash is sterilized, cooled to 60-70°, malt is added, and after 2-3 hrs. the mash is sterilized, cooled to 37° and inoculated with the ferment.

**Yeast.** A. J. M. JENSEN. *Brit.* 150,968, Sept. 11, 1920. In a bakers' yeast of consistency corresponding with pressed yeast, the developed yeast cells are surrounded with nutrient material. The mixt. of yeast and nutrient material is obtained either by fermenting a dough which is so dry as to yield after fermentation a product of the required consistency, or by fermenting in a thick mash, and removing H<sub>2</sub>O after fermentation either by drying or by expressing a part of the liquid. Lactic-acid bacteria may be added to the mash to stop the yeast fermentation and to preserve the yeast during storage.

**Recovering alcohol from fermented liquids.** W. G. TOPLIS. U. S. 1,364,160, Jan. 4. Waste liquor from a primary distn. app. for recovery of alc. from beer or

similar materials is treated to a secondary distn. and the alc. distd. off in the latter is combined with the liquor fed to the primary distn. app. in order to facilitate rapid complete recovery of alc. with low heat loss.

**Vinegar.** E. KLEIN. Can. 207,559, Jan. 11, 1921. This patent relates to the Schutzenbach process of making vinegar and aims to standardize the process, avoid losses by evapn. and render the process independent of the external atm. conditions. The fresh air is precooled and the internal temp. of the generator is controlled by passing the precooled air therethrough in an ascending current. The fluid mixt. capable of undergoing acetic fermentation is precooled and the vapors carried by the spent air are condensed by introducing the precooled mixt. near the top of the generator.

**Apparatus for vinegar making.** E. KLEIN. Can. 207,521, Jan. 11, 1921. App. for operating the process of patent No. 207,599 (above).

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The simultaneous combined neosalvarsan-novasurol treatment of syphilis. C. BRUCK AND H. BECHER. *Münch. med. Wochschr.* 67, 901-2(1920).—Novasurol is a double salt of Na hydroxymercurichlorophenoxyacetate and diethylmalonylurea; it contains 33.9% Hg. It is put on the market in 2 cc. ampules in 10% soln. Novasurol is mixed in the syringe with neosalvarsan and after about  $\frac{1}{2}$  minute when the reaction is complete, the mixt. is injected intravenously.

S. AMBERG

Our experience with verodigen (czitalin). A. MAISEL. Univ. Erlangen. *Münch. med. Wochr.* 67, 803(1920).—Verodigen is a digitalis prepn. which has no advantages.

S. AMBERG

Distillation of camphor in India. J. L. SIMONSEN AND T. P. GHOSH. *J. Soc. Chem. Ind.* 39, 296-8T(1920).—The object of the paper is to record the results of expts. which have been in progress for some years on the camphor content of the various portions of the *Cinnamomum camphora* grown at Dehra Dun and elsewhere within the Indian Empire. These expts. have been mainly concerned with detg. whether the leaves from coppiced trees could not be utilized. For purposes of comparison, twigs have also been distd. and the whole of 2 trees. The results of the expts. are tabulated as to the yield of camphor and oil, and for the year and month, for the leaves, twigs and wood. The oil from the twigs resembled that of the leaves, except for the absence of cineole. It contained much less camphor in soln., but this is a matter of little importance, since in any case the yield of oil from the twigs is too small to warrant their commercial distn. The wood oil is similar though apparently simpler in constitution to that from other localities. It contains safrole in considerable quantity, but cineole is absent. The sesquiterpene fraction contained caryophyllene and cadinene. A considerable proportion of a high-b. fraction was isolated which was possibly identical with Semmler and Rosenberg's camphoracene, insufficient however for investigation. The fractionation expts. are given in considerable detail. The leaf oil was pale yellow and had a  $d_{20}^{30}$  0.9185;  $n_D^{30}$  = 1.47;  $(\alpha)_D^{30}$  + 32.74°. The deep brown twig oil had a d. 0.8777;  $n_D$  1.473. The wood oil was pale yellow and had d. 0.9313;  $n_D$  1.4767;  $(\alpha)_D$  + 34.44°.

W. O. E.

Effect of shaking alkalized aqueous solutions of arsphenamine and aqueous solutions of neoarsphenamine in the presence of air. G. B. ROTH. U. S. Public Health Repts., Rept. 612(1920).—Summarized, the results of the investigation are: Shaking alkalized solns. of arsphenamine, or of neoarsphenamine, in the presence of air renders them highly toxic, as shown by intravenous administration to white rats. The increase in toxicity caused by such shaking is presumably due to the oxidation of these compds. to *p*-hydroxyphenylarsenic oxide, commonly called "arsenoxide," inas-

much as shaking a soln. of neoarsphenamine in the absence of air does not increase the toxicity of such a soln. The toxicity of these solns. is greatly influenced by the manner in which they are prepd. for administration. W. O. E.

**Extraction of jasmin oil.** J. NIVIERRE. *Bull. soc. chim.* 27, 862-5(1920).—There are 2 methods ordinarily employed in the prepn. of this product, namely, (a) extn. with vol. solvents as petroleum ether, or more rarely benzine, and (b) extn. of the living flower with an odorless fat (enfleurage). Following the line of thought first suggested by Passy (*Compt. rend.* 124, 783) and expanded by Hesse (*Ber.* 33, 1585(1900); 34, 293; 2928(1901); 36, 1465(1902); 37, 1457(1903)) to the effect that enfleurage may be carried out by immersion of the living flowers in  $H_2O$  rather than by contact with fat, and that the formation of odoriferous principles is due to the degradation of certain compds., for example, of glucosides by  $H_2O$  into glucose and the essence; in substantiation of the above hypothesis, N. describes the following expts. 40 kg. of jasmin flowers are well mixed, then 20 kg. thereof treated in 2 portions of 10 kg. each for 4 hrs. with dil.  $H_2SO_4$  (20 g. to 100 liters of  $H_2O$ ). The mass is allowed to drain for a period of 10 hours, and the liquid then extd. with petr. ether b. under  $100^\circ$ . The quantity of pomade yielded in the 2 operations was 32 and 31.56 g., resp. A third 10 kg. portion of the flowers yielded on extn. with petr. ether a pomade of 27.05 g. The remaining 10 kg. of flowers were macerated in aqueous suspension for a period of 15 hrs. with a fermented powder obtained by macerating 200 g. finely hacked fresh flowers of jasmin in cold 96% alc., draining and washing the mass with 2 portions of alc. after 12 hr. contact, and subsequent drying *in vacuo* at room temp. The liquid was drained rapidly and extd. with petr. ether. Owing to a lab. mishap, N. is unable to give exact figures, but believes the yield to have been superior to that immediately preceding. The pomades thus obtained gave: acid no. 6.72-7.8; ester no. 93.48-90.6; sapon. no. 100.2-98.4 from hydrolyzed flowers, the corresponding values from non-hydrolyzed flowers being: 10.2; 82.4; 92.6, resp. The pomades were extd. in the cold with 4 portions of 90% alc. After standing 12 hrs. in a mixt. of ice and salt, the cleared soln. distd., and the residue dried *in vacuo*, the sol. portion was found to be 54.8-54.2% for the hydrolyzed flowers, and 48.85% for the non-hydrolyzed material. The oils thus obtained gave:  $d_{15}^\circ$  0.9228-0.9232; acid no. 12.8-13.15; ester no. 117.4-117.95; sapon no. 130.2-131.1 from hydrolyzed flowers, and 0.9326; 18.2; 102.2; 120.4, resp., from non-hydrolyzed material. Calcd. to 1000 kg. of hydrolyzed flowers, the yields are: pomade 3.2-3.156 kg.; oil 1.753-1.71 kg. (2.705 kg. and 1.321 kg., resp., from non-hydrolyzed material). The oil prepd. from hydrolyzed flowers is smoother than that obtained from material not thus treated. From the foregoing results it would appear that, while an appropriate treatment tends to increase the yield of oil, a methodical study should be undertaken to det. the optimum conditions of hydrolysis, and especially to test the use of the enzyme rather than hydrolysis by acids. W. O. E.

**Fractionation of chaulmoogra oil.** ARTHUR L. DEAN AND RICHARD WRENSHALL. *J. Am. Chem. Soc.* 42, 2626-45(1920).—Clinical expts. (cf. McDonald and D., C. A. 15, 121) have shown that injection of the Et esters of various fractions of the fatty acids in the oil (the mixed acids themselves are solid at room temp. and cannot be injected as such) often renders leprosy patients clinically and bacteriologically free of the disease but this effect could not be identified with any of the 4 fractions of acids used. It seemed important to try the action of the esters of pure chaulmoogric (A) and hydnocarpic acid (B), and the consequent necessity of prepg. considerable amts. of these acids led to the present study of the fractionation of the oil. Attempts were made to sep. the fatty acids (1) by crystn. from alc., (2) by means of  $Ba(OAc)_2$ , (3) by fractional distn. of the Et esters *in vacuo*, and (4) by fractional distn. of the acids themselves, followed by fractional crystn. As a result of the experience gained the following method has been devised for the practically quant. extn. of A and B; 240

g. NaOH in 1 l. hot H<sub>2</sub>O is thoroughly mixed with 1500 g. of the oil, autoclaved 1 hr. under 15 lbs., dissolved in 3–4 l. hot H<sub>2</sub>O, acidified with com. HCl, the aq. layer siphoned off, the remaining oil washed with successive portions of hot H<sub>2</sub>O, allowed to stand 1–2 hrs. in a hot H<sub>2</sub>O funnel until all the H<sub>2</sub>O seps., strained through fine-mesh linen and allowed to solidify (yield, 1350–1400 g.). One kg. of this mixt. is distd. in a high vacuum (1–3 mm.) in a specially designed app. The first 350 cc. of distillate is worked up for B; the next 300 cc. is set aside to be redistd. as a part of the next lot of mixed acids and the remainder of the distillate is worked up for A. A is recrystd. from 80% alc. (20 cc. for 5 g.) according to a systematic scheme which is described, and the B from petr. ether (30 cc. to 5 g.). The amts. of A and B vary largely with the quality of the oil, but even with low-grade oil, starting with 1 kg. mixed acids, this method will give at least 50 g. pure B and 100 g. pure A.

CHAS. A. ROUILLER

Quantitative estimation of thymol in mosla oil. TATSUO KARIYONE AND KENJIRO ATSUMI. *J. Pharm. Soc. Japan* 1920, No. 462, 707–13.—Mosla oil, from *Mosla japonica* Maxim, contains thymol, *p*-thymol and other unknown phenol compds. Although presence of carvacrol is not certain, oil of *Mosla japonica* is often contaminated with the oil of *Mosla hadai* Nakai, which contains carvacrol. Since the method of Kremer and Schreiner ests. thymol as well as other phenol compds., it cannot be used for evaluation of mosla oil, where the thymol content alone is important. K. and A.'s method is first to sep. thymol from other phenols by crystn. and then apply the I method. Ten g. of mosla oil is treated with 40 cc. of petroleum ether, and an equal amt. of 5% NaOH, and shaken in a separatory funnel. After repeated extn. with NaOH, all the oily layer is treated with 30 cc. of 15% HCl. An addition of a small crystal to the turbid liquid and shaking, will make pptn. of thymol complete. The crystals are washed free from carvacrol with 10% alc., and cold H<sub>2</sub>O, and are redissolved in 5% NaOH and made up to 500 cc. Ten cc. of this alk. soln. is transferred into another 500-cc. volumetric flask to which 50 cc. of 0.1 N I is added, acidified and made up to 500 cc. with H<sub>2</sub>O. When 50 cc. of this is titrated with Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> the % of thymol is equal to  $[(5-s) \times 0.00037528 \times 100/0.02] = (5-s) 18.764$ , *s* being cc. of 0.1 N Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> taken. If the amt. of uncrystallizable phenols is not more than 9% of total phenols, the exptl. error is within 2%. Since mosla oil always contains less than 10%, this method can be used with accuracy for extn. of thymol in mosla oil. S. T.

Chinese drug she-ch'uang (*Selinum monnieri* L.). MANZO NAKAO. *J. Pharm. Soc., Japan* 1920, No. 462, 685–707.—The Chinese drug she-ch'uang, extensively used in Manchuria, is not *Polamogeton polygonifolius* Pour, *Torilis anthriscus* Gmel, nor *Selinum japonicum* Miq, but is *Selinum monnieri* L. Botanical discussion and sketch of this drug are given. The analysis of its essential oil is given. On steam distn., a yellowish transparent oil (1.3%) is obtained. The oil is not crystallizable at –20°, and has *d*<sub>15</sub> 0.896, *d*<sub>20</sub> 0.893,  $[\alpha]_D^{20}$  –42.7°, acid no. 1.63, sapon no. 23.62, sapon. no. after acetylation 51.35. The fraction I b. 154–7°, has *d*<sub>15</sub> 0.867,  $[\alpha]_D$  –55.42°. The analysis of this fraction showed it to be C<sub>10</sub>H<sub>16</sub>, corresponding *l*-pinene. Its hydrochloride m. 125°,  $[\alpha]_D$  = 19° (in CHCl<sub>3</sub>). Fraction II b. 157–60°, has *d*<sub>15</sub> 0.885,  $[\alpha]_D$  –53.04°, and contains camphene. Fraction III b. 200–50°, has *d*<sub>15</sub> 0.837,  $[\alpha]_D$  –33.14°, and contains borneol ester and isovaleric acid. This essential oil does not contain phellandrene, cineole nor terpineol.

S. T.

Alkaloids of Japanese corydalis bulb. Y. ASAHINA AND S. MOTIGASHI. *J. Pharm. Soc., Japan* 1920, No. 463, 766–72.—Makoshi (cf. C. A. 3, 572) found 2 alkaloids in Japanese corydalis bulb, protopine and either dehydrocorydaline or berberine. The authors have recognized the presence of non-phenolic (alkali-insol.) alkaloids. They have sepd. the alkaloids of Japanese corydalis bulb into non-phenolic and phenolic groups. From the former protopine has been isolated (0.1%) and from the latter bulbocapnine (0.1%) and a small amt. of another base m. 175°.

S. T.



**Determination of morphine in opium. IV. The efficiency of the Helfenberger method in the examination of opiums with different morphine contents.** AXEL JERMSTAD. *Schweis. Apoth.-Ztg.* 58, 462-4(1920); cf. C. A. 14, 3123; 15, 291.—The method (Helfenberger *Ann.* 1897, 188), is believed to be useless for the assay of opium low in morphine. After removal of narcotine the method results in 36 g. of fluid from which morphine is to be pptd. J. prepd. a series of 20 solns. contg. in 36 g. increasing amts. of morphine-HCl corresponding to 1-16% of morphine in the opium employed. In each case, the fluid (36 g.) is shaken for 10 min. with 4 g. *N* NH<sub>4</sub>OH and 10 cc. Et<sub>2</sub>O. No morphine whatever is pptd. in a liquid from opium with 1% morphine. At 3% parallel results disagree and are about 40% too low. At 5%, results are concordant, and 12% too low. Between 7 and 13%, the amt. of morphine recovered is 92.479 and 92.738%, and at 15-16% in opium, 94% is recovered. The loss of morphine in the 7-13% detns. is 0.4-0.78 mg. per cc.; the actual losses are greater at higher concns. than at lower ones. Leclère (C. A. 7, 3193) using the lime method of the Codex, finds a const. loss of 0.57 mg. per cc. Annet and Singh (C. A. 13, 631, 887) show incomplete recovery by the lime method (*Brit. Pharm.*) from solns. low in morphine. S. W.

**Aromatic plants of Madagascar.** P. M. *Schweis. Apoth.-Ztg.* 59, 601-3(1920).—A report on the cultivation of ylang-ylang, geranium, cloves, vanilla, eucalyptus, etc. The introduction of some aromatic plants successfully cultivated in Réunion is recommended. S. WALDBOTT

**Some Turkestan remedies.** P. CASPARIS. *Schweis. Apoth.-Ztg.* 58, 497-501, 512-5(1920).—Analysis of 21 samples sent by R. Wacker confirms Dragendorff's report (1872-4) that Turkestan remedies are almost entirely simple plant drugs; still, 2 complex mixts. indicated foreign Oriental origin, and substitution of cinnabar by BaSO<sub>4</sub> tinted with a H<sub>2</sub>O-insol. coal-tar dye, showed Western influence. S. WALDBOTT

**Tona-vin.** ANON. *J. Am. Med. Assoc.* 76, 193-4(1920).—This prepn. is sold by the Thomas Chemical Co., of Pittsburgh. It is claimed to be "a palatable and energizing treatment containing sol. iron and quinine, fluidextract of senna leaves, wild cherry and aromatics." The presence of 18% of EtOH is admitted. The bottle contains a little less than 11 fl. oz. although 12 fl. oz. are declared. Solids were 11.42 g. per 100 cc. Phenolphthalein, Br, I, MgSO<sub>4</sub> and Na<sub>2</sub>HPO<sub>4</sub> were absent. Alkaloids, Fe, and exts. from an emodin-bearing drug were present. Total alkaloids 0.0222 g. per 100 cc., or about 1/11 of a dose of quinine in a dose of the prepn. Fe 0.029 g. per 100 cc., or about 1/11 of a medicinal dose of Fe per dose of prepn. One dose of the prepn. was dealcoholized and the residue swallowed by a healthy man. No result except a doubtfully laxative action was observed. This together with the chem. examn. demonstrates that the prepn. is not sufficiently medicated to prevent its use in moderate amts. as a beverage. L. E. WARREN

**Chemistry of heptane and its solution.** E. KREMMERS. *J. Am. Pharm. Assoc.* 9, 857-60(1920).—History of heptane and a review of its properties. L. E. WARREN

**The influence of hydrochloric acid on cinchona preparations.** WILBUR I. SCOVILLE. *J. Am. Pharm. Assoc.* 9, 864-8(1920).—Cinchona, both red and yellow, was extd. by the U. S. P. process and by the same process modified by the addition of 100 cc. of 10% HCl per kg. of drug. The extns. were carried out at different speeds. S. concludes that the addition of HCl facilitates the extn. of the alkaloids from both kinds of cinchona and that the prepn. are less apt to ppt. if acid be used. Acid should be used in sufficient quantity to convert all of the alkaloids into salts. Acid should be used in all liquid prepn. of cinchona. In assays of cinchona the results are more nearly correct if acid be used and the alkaloid extd. is in a purer form than by the U. S. P. assay. L. E. WARREN

**The function of glycerol in tinctures and fluid extracts.** WILBUR I. SCOVILLE. *J. Am. Pharm. Assoc.* 9, 868-77(1920).—Glycerol is a component of many fluidexts.

and tincts. It has been employed in the belief that it aids in the extn. of the drug and prevents or lessens pptn. in the stored prepn. Hitherto no systematic investigation of the logic of these uses has been made. In these expts. two lots of the same specimen of drug were extd. under the same conditions of temp. and speed, one (A) using the official menstruum ( $C_2H_5(OH)_4$ ,  $H_2O$  and  $EtOH$ ) for the prepn. being studied and the other (B) using a dil.  $EtOH$  of the same strength as the official menstruum but without glycerol. A exts. were finished according to the official method. After extn. portions of B exts. were adjusted to the glycerol of the official preps. by adding this substance and sucrose or glucose added as required by A. Preps. of the same type and drug were finished on the same day, compared for color and appearance and set aside for assay and storage observations. As judged by alkaloidal assay glycerol aids extn. of red cinchona and retards it in calisaya. In lessening pptn. while in storage the presence of  $HCl$  (cf. preceding abstr.) acts better than glycerol but the latter has some influence as compared with portions stored without glycerol. With calisaya sucrose and glucose retard pptn. but this effect is not produced with red cinchona. With hydrastis glycerol retards extn. of the alkaloids but its addition to the percolate lessens pptn. Of the cathartic drugs studied glycerol retards extn. of rhubarb but aids that of butternut. Its presence showed no advantage in preventing pptn. in either. Sucrose and glucose offer no advantage here. With geranium glycerol retards extn. but lessens pptn. Sucrose and glucose lessen pptn. but not so much as glycerol. With hamamelis glycerol aids markedly in extn. and materially lessens pptn. Glucose also lessens pptn. but its use is not as satisfactory as that of glycerol. With krameria glycerol aids in extn. and lessens pptn. and the results with nutgall are similar. With quercus glycerol slightly aids in extn. and slightly lessens pptn. With rhus glabra glycerol retards extn. but has no effect on pptn. With rose glycerol acts advantageously in the extn. of tannins and it markedly lessens pptn. With apocynum, cardamom, cinnamon, calumba, gentian, taraxacum and thyme glycerol shows no advantage. With sarsaparilla glycerol lessens pptn. but not so much as sucrose or glucose. With stillingia glycerol shows no advantage in extn. but it increases pptn. while sucrose and glucose are worse than glycerol in this respect. With uva ursi a slight disadvantage appears to lie with the glycerol menstruum but its presence lessens pptn. Of 27 preps. tested only 9 show any advantage in the use of glycerol while some show distinct disadvantage. In general only in the astringent drugs does glycerol appear to be of advantage in extn. while as a stabilizer of the finished preps. sucrose and glucose may sometimes be preferable.

L. E. WARREN

Estimation of phosphatides (BRAUNS, MACLAUGHLIN) 11B. Gum arabic (RIDGWAY) 28.

SCHNEIDER, ALBERT: *The Microanalysis of Powdered Vegetable Drugs*. 2nd Ed. Philadelphia: P. Blakiston's Son & Co. 548 pp. \$5.

Synthetic drugs. LOWY LABORATORY, INC. Brit. 152,298, Apr. 9, 1920. For the purpose of stabilizing an aq. soln. of an arsenobenzene compd. such as arspenamine an amt. of alkali is added which is in slight excess of that required to neutralize the soln. After being rendered gas-free by the use of vacuum, the soln. is sealed in ampoules.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

T. LYNTON BRIGGS

The behavior of mixtures of sulfuric acid and nitric acid during distillation. J. BAUMANN. *Chem.-Ztg.* 44, 805(1920).—A 508-g. mixt. containing 68.1%  $H_2SO_4$  and

17.8%  $\text{HNO}_3$  was carefully distd. The temp. gradually rose to  $150^\circ$  during which 42 cc. distillate, containing 95.4%  $\text{HNO}_3$  and only traces of  $\text{H}_2\text{SO}_4$  was collected. The temp. was afterward raised to  $180^\circ$ , 62 cc. of distillate containing 92%  $\text{HNO}_3$  and 0.27%  $\text{H}_2\text{SO}_4$  being collected. No further dropping of distillate at this temp. was observed. The recovery of  $\text{HNO}_3$  was 94.8% in the distillate and 5.0% in the residual acid, the  $\text{HNO}_3$  concn. in this being 1.18%  $\text{HNO}_3$ . In a second expt. 498 g. mixt. containing 71.9%  $\text{H}_2\text{SO}_4$  and 12.5%  $\text{HNO}_3$  was subjected to the same distn. and in this case the  $\text{HNO}_3$  recovery was 88.6% in the distillate and 11.3% in the residual acid. This second test, however, contains some palpably erroneous figures. From these two tests it is concluded that the  $\text{HNO}_3$  loss due to retention in the sulfuric acid, when concg. nitric acid, is greater the weaker the acid to be concd. F. C. ZEISBERG

**Saltpeper circulation in the manufacture of sulfuric acid by the lead chamber process.** MOTOTARO MATSUI. *J. Chem. Ind., Japan* 23, 555-72.—Data obtained during inspection trip through U. S. and Europe are compared and reviewed. S. T.

**Points on buying caustic soda.** CHARLES F. GOLDTHWAIT. *Textile World J.* 57, 641-5(1920).—Various bases for purchase and value of different caustics in special processes are discussed. CHAS. E. MULLIN

**The synthesis of nitrogenous compounds in Germany at the present day.** ANON. *Technique moderne* 12, 449-60(1920).—A detailed description of the Badische plant at Oppau for the manuf. of  $\text{NH}_3$  (by the Haber process),  $\text{HNO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{NH}_4\text{NO}_3$  and  $\text{NH}_4\text{NO}_2$ , together with a brief discussion of the possibilities of establishing a synthetic N industry in France, using the Claude process. A. P.-C.

**Crystal soda and fine soda.** H. B. *Z. deut. Oel-Fett-Ind.* 40, 709-12, 727-8(1920).—*Coarse crystals.* To aid the formation of hard crystals of  $\text{Na}_2\text{CO}_3$ , B. adds per 100 lbs. of soda ash the usual 4% to 6% Glauber salt, and to prevent attack on the iron vessels by the acid reaction of the  $\text{Na}_2\text{SO}_4$  soln. he adds it after a portion of the  $\text{Na}_2\text{CO}_3$  has made the vat contents strongly alk. The hot satd.  $\text{Na}_2\text{CO}_3$  soln. shows  $32^\circ$  Bé. and, if colored yellow by org. matter, is bleached by boiling with 1-2 kg. bleaching powder, in the form of a milk, per  $\text{m}^3$  soln.; it is boiled again with 1-2 kg.  $\text{Al}_2(\text{SO}_4)_3$  dissolved in  $\text{H}_2\text{O}$ , per  $\text{m}^3$ —a clear soln. resulting. If boiling is impractical, B. mixes with each  $\text{m}^3$  of soln. 1 to 1.5 l. of a soln. made by adding 10 kg. bleaching powder to 15 kg. of  $40^\circ$  Bé.- $\text{NaOH}$  dild. by 35 kg.  $\text{H}_2\text{O}$ , and simply agitates. The clarified  $\text{Na}_2\text{CO}_3$  is cooled to  $37^\circ$ , showing 35.5 to  $36^\circ$  Bé. Crystn. requires 8-14 days, varying with the season. After removal from the crystallizing tanks by hammer and chisel and after draining, the crystals are centrifuged. *Fine crystals.* A rust-free kettle that can be cooled to  $14^\circ$  is filled with the satd. and clarified soda soln. at  $30^\circ$  and of  $35$  to  $36^\circ$  Bé.; some cold  $\text{H}_2\text{O}$  is added for diln. and the whole agitated for several hrs., with cooling to  $16$  to  $14^\circ$ , until a thick mush of crystals forms; the walls are kept free from crystals during agitation. The crystal mass is run on a cloth-covered filter arrangement and the drained crystals are then centrifuged. To prevent caking in storage the centrifuged crystals are mixed with 2% to 3% soda ash. Rust-free app. throughout is essential. P. ESCHER

**Niter cake, 1915-1919.** H. T. CALVERT AND E. H. MORRIS. *J. Soc. Chem. Ind.* 39, 407-11R(1920).—The wartime measures taken by the Acid Supplies Branch of the Explosives Department of the British Ministry of Munitions for the utilization of niter cake are described. Statistics of production and consumption, methods of transportation and distribution are given. Granulated material obtained by playing compressed air on a falling stream of molten niter cake or by rabbling as well as cake and soln. forms were supplied. The principal uses were in grease recovery, bleaching and dyeing, metal pickling and cleaning, and  $\text{HCl}$  manuf. The remaining 10% was distributed equally among mineral water manuf. and some twenty miscellaneous uses which are enumerated. R. L. BROWN

**Manufacture of stannic chloride.** SHUCHIRO OCHI. *J. Chem. Ind. Japan* **23**, 583-94(1920).—The best conditions for the manuf. of  $\text{SnCl}_4$  from Sn and Cl were studied. *Conclusions:* When Cl is made to act directly on metallic Sn, the gas must be absolutely free from moisture, which retards the reaction. The optimum temp. is  $114^\circ$ . If the gas is first passed into S and then sulfur chloride allowed to act on Sn, moisture is no longer injurious. An excess of sulfur chloride (1 or 2 times the theoretical value) may be used, the unused portion being easily removed by boiling and distg. with anhydrous  $\text{SnCl}_4$ . When Cl is used directly on Sn the use of sulfur chloride as catalyzer accelerates the action. If 3.5 g. of the chloride is used for each 100 g. of Sn, the temp. should be kept at  $100^\circ$ . If more catalyzer is used, the temp. is a less important factor.  $\text{SnCl}_4$  can also be prepd. directly by the action of sulfur chloride upon  $\text{SnCl}_2$ ,  $\text{SnO}$ ,  $\text{SnS}$  and  $\text{SnS}_2$ , but not  $\text{SnO}_2$ . When waste Sn compds. are used, they should be first converted into sulfide. By adding 28 parts of  $\text{H}_2\text{O}$  to 100 parts of  $\text{SnCl}_4$ , a hydrate is obtained which is convenient for use and transportation, etc. S. T.

**Operations of the Morton Salt Company at Burmester, Utah.** ANON. *Salt Lake Mining Rev.* **21**, No. 19, 21-2(1920).—A general history of salt is given from Biblical to the present time, together with the locations of all important deposits. The operations of the Morton Co. in Utah consist of drawing the water into elevated ponds, allowing it to evaporate during the summer months, drawing off the excess water in the autumn and after final drying, harvesting by means of gasoline tractors into piles of several hundred tons, which are allowed to "cure" during the winter. After being dried in kilns, a great portion is then refined. A. H. HELLER

**Bauxite mining in Upper Hesse.** E. HÜFFNER. *Chem.-Ztg.* **44**, 785-6(1920).—The deposits in Upper Hesse near Vogelsberg are the only known bauxite resources of commercial promise in Germany. The bauxite, which is probably of basaltic origin, occurs in strata 1 to 8 meters in depth and is easily mined by stripping off the overburden of loam. The ore is washed on a metal sieve and tumbled in a revolving drum. The red clay sepd. by the sieve contains enough Fe to be valuable for use as a pigment; another portion of the crude ore serves for the manuf. of refractory brick. Seven analyses of the washed bauxite from different mines range in  $\text{Al}_2\text{O}_3$  content from 48.96% to 60.94%, with 0.9% to 5.5% of  $\text{SiO}_2$ , 3.13% to 19.09% of  $\text{Fe}_2\text{O}_3$ , and 0.33% to 3.33% of  $\text{TiO}_2$ . There are at present 15 mines in the Vogelsberg district, employing 800 to 1000 men. A washer for refining ore located at Münster serves a number of mines. The development of these deposits was largely caused by war demand, but the hope is expressed that continued progress will render the German Al industry independent of French and Austrian bauxite. S. D. KIRKPATRICK

**Present-day methods for the manufacture of hydrogen.** ANON. *Chem. Age (London)* **3**, 504-5(1920).—Of all processes suggested for the manuf. of H, only the Fe-steam, the water gas catalytic, the electrolytic, and the liquefaction processes are possible commercially. Each is briefly reviewed with emphasis on the Fe-steam process. In this process full utilization of the waste reducing gases results in the production of 1 vol. H for 2 vols. water gas. Theoretically the same heat balance exists as in the water gas catalytic process, resulting in the production of 1 vol. H from 1 vol. of CO, which is the net result of the cycle  $(4\text{CO}_2 + 4\text{H}_2 + 8\text{H}_2\text{O} = 4\text{CO} + 4\text{H}_2\text{O} + 8\text{H}_2)$ . Researches may develop a more suitable Fe mass, a better utilization of waste gases, and less radiation losses. Advantages claimed are: greater purity of H, cheapness, and ease of operation. W. H. BOYNTON

**Recent advances in the American sulfur industry.** RAYMOND F. BACON AND HAROLD S. DAVIS. *Chem. Met. Eng.* **24**, 65-72(1921). E. H.

**Desulfurizing pyrites ash.** FR. FICHTER AND ERNST SCHAFFNER. *Helvetica Chim. Acta* **3**, 869-72(1920).—Preliminary expts. are reported in which it is shown

that the S content of the ash may be reduced from 0.193% to 0.119% by heating with an elec. current for 30 min. to 1350–1400° (18 amp.). When heated in a current of H to about 1030°, the S content was reduced to 0.098%. A third way consists in dissolving the ash in a very concd. hot NaOH soln. and electrolyzing according to Ger. patents 298,339 and 299,835, by which one obtains practically S-free iron. C. J. WRSR

**Latest methods for the preparation of artificial cork.** S. HALEN. *Kunststoffe* 10, 219–20 (1920).—Patent review. C. J. WRSR

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Producer gas in the manufacture of cyanides (U. S. PAT. 1,364,838) 21.

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**Sulfuric acid.** C. J. REED. U. S. 1,363,918, Dec. 28. A mixt. of air, SO<sub>2</sub> and oxides of N is heated, the gaseous reaction products are absorbed in concd. H<sub>2</sub>SO<sub>4</sub> and oxides of N are subsequently removed from the soln. and concd. H<sub>2</sub>SO<sub>4</sub> is recovered.

**Arsenious acid.** M. UCHINO. Brit. 152,526, Oct. 27, 1919. Arsenious acid is refined by mixing it with CuO or a mixt. of CuO and Fe<sub>2</sub>O<sub>3</sub> and then distg.

**Nitric acid.** SOC. L'AZOTE FRANÇAIS. Brit. 152,031, Oct. 6, 1920. HNO<sub>3</sub> up to 55% strength is obtained by absorption of dil. N oxides in H<sub>2</sub>O absorbed in fibrous substances such as glass wool or asbestos, or, if the strength does not exceed 50%, cotton may be used. The acid may be expressed from the absorbent fibrous material, or the process may be made continuous by supplying a small stream of H<sub>2</sub>O to the fibrous material contained in a tower or chamber while the current of gas is passing, and drawing off the acid at the bottom.

**Nitric acid.** P. A. GUYE. Can. 207,226, Jan. 4, 1921. An aq. soln. of HNO<sub>3</sub> is caused to react with N<sub>2</sub>O<sub>5</sub> in the nascent state formed in immediate proximity to the soln. by the reaction between N<sub>2</sub>O<sub>4</sub> and O<sub>3</sub>.

**Concentration of nitric acid.** OLAF JENSEN. Can. 207,546, Jan. 11, 1921. HNO<sub>3</sub> to be concd. is partially evapd. while maintaining the acid in motion and causing the sepn. of pptd. solids and the vapors are passed into contact with concd. H<sub>2</sub>SO<sub>4</sub>. Cf. C. A. 14, 453.

**Nitric anhydride.** P. A. GUYE. Can. 207,225, Jan. 4, 1921. N<sub>2</sub>O<sub>5</sub> is made continuously by the reaction of an oxide of N of a degree of oxidation lower than N<sub>2</sub>O<sub>5</sub> and higher than N<sub>2</sub>O wherein two gaseous currents, one containing at least one of the oxides of N, the other containing O<sub>3</sub>, are caused to react in such proportion to each other that there is present an excess neither of O<sub>3</sub> nor of oxides of N, the N<sub>2</sub>O<sub>5</sub> formed being dissolved from the gaseous current at a temp. below –20° in a suitable sol-vent such as concd. HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub> or CCl<sub>4</sub>.

**Ammonia.** C. T. THORSELL and H. L. R. LUNDEN. Brit. 151,984, Sept. 17, 1920. In the production of NH<sub>3</sub> from cyanides which have been produced by the fixation of free N in a mass of base, C and a metallic catalyst, the reaction mass is discharged in its hot condition into the autoclave in which it is to be treated with H<sub>2</sub>O, with exclusion of air, and a gas not containing free O is maintained above the liquid in the autoclave, thus obviating the danger of explosion of liberated H.

**Ammonia.** C. T. THORSELL and H. L. R. LUNDEN. Brit. 152,011, Sept. 17, 1920. In the production of NH<sub>3</sub> by treatment of cyanides and cyanamides with H<sub>2</sub>O under pressure, the cyanide or cyanamide in the hot state as produced is placed in the pressure vessel so as to utilize the contained heat for raising the H<sub>2</sub>O to the necessary temp. for the production of NH<sub>3</sub>.

**Catalyst for ammonia synthesis.** J. C. CLANCY. U. S. 1,363,392, Dec. 28. A catalyst suitable for use in the synthesis of NH<sub>3</sub> is prepd. by treating a supporting medium such as acid-washed pumice or asbestos with a soln. of Ca<sub>2</sub>Fe(CN)<sub>6</sub> and then subjecting the coated support to the action of N and H and limited heating in order to form an active catalyst upon it.

**Synthetic production of ammonia.** J. C. CLANCY. U. S. 1,363,393, Dec. 28. This pat. relates to the use of a catalyst such as described in the preceding pat.  $\text{Ba}_2\text{Fe}(\text{CN})_6$ ,  $\text{Sr}_2\text{Fe}(\text{CN})_6$ ,  $\text{K}_2\text{Fe}(\text{CN})_6$  and corresponding ferricyanides also may be used in prepg. the catalyst.

**Production of alkali sulfides from silicates.** EINAR BERGVE. Can. 208,006. Jan. 25, 1921. Sulfides are produced from alkali metal silicates by smelting the latter with ferrosilicon and pyrite.

**Alkali percarbonates.** H. WADE. Brit. 152,366, Aug. 20, 1917. Solid alkali percarbonates are obtained by treating  $\text{Na}_2\text{CO}_3$  with  $\text{H}_2\text{O}_2$  in presence of sufficiently limited quantities of  $\text{H}_2\text{O}$  to produce the solid product directly, and of  $\text{NaCl}$  for salting out the product. A previous calcination of the  $\text{Na}_2\text{CO}_3$ , and the addition of anti-catalyzers such as Na silicate,  $\text{MgCl}_2$  and  $\text{Mg-Na}$  silicate are advantageous.

**Splitting double sodium and ammonium sulfates.** G. N. VIS. U. S. 1,364,822, Jan. 4. The double salt  $\text{Na}_2\text{SO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$  is dehydrated and the dehydrated product is heated in a soln. containing  $(\text{NH}_4)_2\text{SO}_4$ . The anhydrous  $\text{Na}_2\text{SO}_4$  which seps. is removed from the soln. and the latter is cooled to sep.  $(\text{NH}_4)_2\text{SO}_4$  mixed with about 10% of  $\text{Na}_2\text{SO}_4$  and the liquid is used for further carrying on the process.

**Thorium salts.** H. WADG. Brit. 151,854, Nov. 19, 1919. An insol. compd. of Th is obtained by heating a material such as monazite sand, in which Th and  $\text{H}_3\text{PO}_4$  are associated, with fuming  $\text{H}_2\text{SO}_4$ . The heating is effected first at  $200-30^\circ$  and finally at  $300-30^\circ$ . The product is treated with  $\text{H}_2\text{O}$  with slight agitation when the soln. of the rare earths with the Th compd. in suspension is decanted from heavy residues and the Th compd. is filtered off.

**Potassium sulfate from brines containing carbonates.** J. A. CULLEN. U. S. 1,363,091, Dec. 21. Solns. containing carbonates such as saline lake waters are treated with lime to ppt. the carbonates and there is then added to the soln. a sol. sulfate such as  $\text{Na}_2\text{SO}_4$  in excess of the amt. required to furnish  $\text{SO}_4$  to combine with the K in the soln. which is not already in the form of sulfate. The  $\text{K}_2\text{SO}_4$  is then recovered by concn. and crystn.

**Potassium compounds from solutions containing carbonates.** J. A. CULLEN. U. S. 1,363,092, Dec. 21. Natural brines such as saline lake waters containing chlorides and carbonates are treated with lime to ppt. the carbonates and sufficient  $\text{NaCl}$  is then added to the soln. to supply Cl for combination with such of the K in the soln. as is not already so combined. The soln. is then concd. and the  $\text{KCl}$  recovered by crystn. The remaining mother liquor may be treated to recover  $\text{K}_2\text{SO}_4$ .

**Magnesium chloride.** H. J. BULL. Brit. 149,670, July 30, 1920. Anhydrous  $\text{MgCl}_2$  is produced by reacting upon  $\text{MgO}$ , magnesite, dolomite, or hydrated  $\text{MgCl}_2$  at a suitable temp. such as  $500-600^\circ$  with a carbon-chlorine compd. such as  $\text{CCl}_4$  or  $\text{COCl}_2$ . If  $\text{CCl}_4$  is used,  $\text{COCl}_2$  is produced in the first stage of the reaction. The  $\text{MgCl}_2$  may be electrolyzed for Mg and the Cl used to prep. a carbon-chlorine compd. for the main reaction. If dolomite is used, a mixt. of Ca and Mg chlorides is obtained which may be used in the electrolysis. If impure magnesite is used, the product may be fused and decanted from the impurities.

**Anhydrous magnesium chloride.** E. A. ASHCROFT. Brit. 152,401, July 9, 1919. Hydrated  $\text{MgCl}_2$  is converted into the anhydrous compd. by partial dehydration in a voluminous current of heated air, preferably dried, until the fusion point is raised above  $150^\circ$ , followed by treatment with a slow current of  $\text{HCl}$  gas to complete the dehydration; during dehydration, fusion of the mass is to be avoided, and the product obtained is porous if a temp. of  $500^\circ$  is not exceeded, and of a partly cryst. texture if the temp. is allowed to rise to incipient fusion,  $650^\circ$ ; after dehydration, the product may be fused. The  $\text{MgCl}_2$  is preferably employed in the form of needle crystals such

as are obtained by cooling a soln. having a strength of 80° Tw. from 50° to atm. temp. A suitable app. is specified.

**Magnesium; magnesium alloys; magnesium chlorate.** E. A. ASHCROFT. Brit. 152,403, July 9, 1919. In a process for the production of Mg or Mg alloys, and  $\text{Mg}(\text{ClO}_3)_2$ , hydrated  $\text{MgCl}_2$  is dehydrated, *e. g.*, according to 152,401 (above), the dehydrated chloride is electrolyzed to produce Mg or a Mg alloy, *e. g.*, according to 152,402, the Cl obtained as a by-product is absorbed in  $\text{MgO}$  emulsion producing  $\text{MgCl}_2$  and  $\text{Mg}(\text{ClO}_3)_2$  which are sep'd. by crystn., and the  $\text{MgCl}_2$  is again used in the process. To render the process continuous, an additional supply of Cl is admitted to the absorber. Cf. 3690, 1883, and 21,976, 1896.

**Sulfuryl chloride.** T. H. DURRANS. U. S. 1,364,738, Jan. 4. In the production of  $\text{SO}_2\text{Cl}_2$ ,  $\text{SO}_2$  and Cl are caused to react in the presence of aliphatic esters, triphenyl phosphate, tricresyl phosphate, eucalyptol, BzH or benzyl acetate.

**Washing crystals.** J. T. WINDRAM. Brit. 152,041, Aug. 13, 1918. Crystals deposited from a soln. containing more than one salt are freed from mother liquor in a centrifugal machine, the process being completed by treating the crystals as soon as the bulk of the mother liquor has been removed with  $\text{H}_2\text{O}$  in a state of fine subdivision, either as spray or wet steam, so that no dry air can enter the mass until all the mother liquid has been removed. The crystals are preferably taken from the evaporator and treated at the temp. of their formation, the steam being introduced at a temp. suitable to bring about this result. A centrifugal machine such as that described in 119,706, which can discharge the crystals without stopping, is preferably used. The process is described in connection with freeing crystals of  $\text{Na}_2\text{CO}_3$  from a liquid containing common salt.

**Sulfur dioxide.** VEREIN CHEMISCHER FABRIKEN MANNHEIM. Brit. 149,662, July 8, 1920.  $\text{SO}_2$  is volatilized when sulfates of the alk. earths, and Mg and Fe sulfates are heated at a comparatively low temp. in the presence of certain reducing agents. Preferably, the latter are added only in sufficient quantities for the sulfates to be reduced to the sulfite stage; the reduction being effected by means of metallic Fe, other metals capable of being obtained by reduction with H, the lower oxides of these metals, or coal. Excess reducing agent, or sufficient to form sulfides, may be employed however, but the process is then performed in two stages. The reduction is first effected at about 600°, and then the S is volatilized as  $\text{SO}_2$  and  $\text{H}_2\text{SO}_4$ , at 900°, in a current of steam and air. When excess is used, coal, water gas, or other reducing-gas may partly replace the metals or their low oxides, and the latter may be produced during the actual process from higher oxides. The reduction may be carried out in an atm. of N or other indifferent gas, or in a vacuum, and the metal can be recovered from the residual mass by removal of the lime after reduction. In examples gypsum, hepaticite, and  $\text{MgSO}_4$  are reduced by the methods given above by means of Fe powder, anthracite, and Fe protoxide, with evolution of  $\text{SO}_2$ .

**Apparatus for the production of sulfur oxides.** T. A. CLAYTON. U. S. 1,364,716, Jan. 4. S is burned on a hearth above which baffles are placed and air currents are supplied to the app. at different heights to secure complete oxidation of the S and assist in forcing the gases to the outlet of the app. The app. is especially adapted for use in fumigation or disinfection.

**Sulfur.** C. G. COLLINS. Brit. 152,447, July 22, 1919. To recover S from the gases obtained in the roasting and smelting of S-bearing ores, the gases in a dry state are passed into a cooling chamber maintained at a temp. slightly above the condensation point of S, and then into a condensing chamber at a lower temp., the S depositing on collecting material in this chamber. The temp. of the cooling chamber is controlled by varying the speed of the gases. A suitable construction is specified.

**Hydrogen.** C. TONIOLO and DR. ROSSI OFFICINE ELETTROCHIMICHE. Brit.

152,554, Jan. 5, 1920. In the Fe-steam and analogous processes of prep. H, the O is reduced by smelting-furnace gases such as those produced in elec. smelting furnaces or in blast furnaces fed with O or with air enriched with O or with air alone.

**Hydrogen.** R. H. UHLINGER. U. S. 1,363,488, Dec. 28. H is produced by heating a hydrocarbon material such as natural gas or hydrocarbon oil to a temp. of 500–900° and then introducing it into a decomposing chamber which may be filled with checkerwork maintained at a temp. of 1100–1300°. C black is also produced and sepd. from the H by elec. pptn.

**Hydrogen peroxide.** R. JACQUELET. U. S. 1,364,558, Jan. 4. In prep. a  $H_2O_2$  soln.,  $BaO_2$  is added to a weak soln. of HCl,  $HNO_3$  equiv. to the HCl is added, and more  $BaO_2$  is added, and this procedure is repeated until a soln. of  $H_2O_2$  of the desired strength is obtained. The soln. contains a small amt. of dissolved  $BaCl_2$ .

**Metal oxides and other compounds by the Wetherill process.** JAS. A. SINGMASTER, FRANK G. BREYER and ALBERT E. HALL. Can. 207,541, Jan. 11, 1921. In the production of "sublimed lead" or other metal oxides or compds. of volatilizable metals by the Wetherill process, the fuel bed on the furnace hearth is formed of briquets. Sublimed basic Pb sulfate is produced from PbS and C with oxidation of the fume.

**Dissolving magnetic iron oxide and other difficultly soluble substances.** H. D. RANKIN. U. S. 1,364,804, Jan. 4. Difficultly sol. constituents of ores or other substances are rendered sol. by heating under pressure with  $NaHSO_4$ ,  $NaHSO_3$ ,  $Fe_2(SO_4)_3$  or similarly acting salts, with or without nitrates or chlorides. Among the materials susceptible to this treatment are:  $Fe_3O_4$ ,  $SnO_2$ , Mn oxides, silicates of Cu, Ni and Zn,  $BaSO_4$ ,  $HgS$ , ignited  $Fe_2O_3$ , ignited  $Al_2O_3$ , ferrites and various alloys.

**Zinc oxide.** JAS. A. SINGMASTER. Can. 207,543, Jan. 11, 1921. In the production of sublimed ZnO a bed of a reducible compd. of the Zn and a combustible material is formed, ignited and advanced during its combustion through a suitable chamber while a combustion-supporting draft current is forced through the bed and the effluent is collected at successive points along the path of movement.

**Zinc oxide.** JAS. A. SINGMASTER. Can. 207,544, Jan. 25, 1921. App. for operating the process of Can. patent 207,543 (above) comprises a refractory tunnel structure, a traveling grate surface adapted to move therein, means for transmitting combustion-supporting gas through the grate surface and a plurality of fume off-takes.

**Zinc oxide.** JAS. SINGMASTER and FRANK G. BREYER. Can. 207,545, Jan. 11, 1921. In the production of ZnO or leaded ZnO by the Wetherill process the fuel bed is supplied to the furnace hearth in the form of briquets which may also contain the Zn-bearing material.

**Lampblack.** J. M. GERARD and H. J. MASSON, JR. U. S. 1,364,273, Jan. 4. Decompn. of hydrocarbon fluids is effected by contact with a highly heated inert gas to liberate free C, and the latter and other products are rapidly moved out of the zone of high temp. to prevent the C from losing its deep black color, cooled by a  $H_2O$  spray to prevent further reactions and subjected to elec. pptn.

**Solvents.** A. HENNING. Brit. 152,550, Dec. 24, 1919. Addition to 131,573 (C. A. 14, 326). The mixts. of MeCl and EtCl, described and produced as in the principal patent, are used as solvents for the extn. of fats, oils, resins, perfumes, etc. The practically pure *ethyl chloride* produced by fractional distn. of the mixts. may be used in the manuf. of dyestuffs.

**Coating compositions.** A. C. HOLZAPFEL and P. WALTHER. Brit. 151,793, Aug. 16, 1919. A compn. for coating Fe, steel, or wood consists of stearin pitch, asphalt, and coal-tar distillates ranging from benzene to heavy tar oil. Pigments may be added.

**Luting mixture.** R. J. WALKER. U. S. 1,364,224, Jan. 4. A luting mixt. adapted for repairing holes in castings is formed of S 8, emery 8, powdered metal, e. g., Al 3, borax 2 and graphite 2 parts, molded into stick form.



**Copying-pad composition.** N. B. BROWNE. U. S. 1,364,542, Jan. 4. A compn. for use in making copies of written or printed matter is formed of Mg silicate 200,  $\text{CaCO}_3$  150,  $\text{MgSO}_4$  10, glycerol 130, acacia gum, tragacanth gum and dextrin 3.3 parts each.

**Polishing diamonds.** C. J. COLEMAN. U. S. 1,364,353, Jan. 4. Diamonds are held, during the polishing operation, in an adherent cement which may be formed of Dixon's stove polish 100,  $\text{Pb}(\text{NO}_3)_2$  10, Sb nitrate 15 and  $\text{H}_2\text{BO}_3$  20 parts or other similar cementing mixt.

**Non-freezing solution for automobile radiators.** C. S. SANFORD. U. S. 1,363,816. Dec. 28. A mixt. of  $\text{CaCl}_2$  94, Na borate 4 and burnt sugar 2% is used for prep. a soln. of low f. p. for use in automobile radiators.

**Treating molds to separate patterns from them.** V. LOUGHEED. U. S. 1,364,124, Jan. 4. Patterns formed from wax or like fusible material are removed from molds of plaster of Paris by subjecting the mold and contained pattern to a bath of hot  $\text{H}_2\text{O}$  which is rendered inert to the material of the mold by the addition of  $\text{CaSO}_4$  to satn. before use.

**Adhesive.** A. ANKLI. U. S. 1,363,830, Dec. 28. Concd. and oxidized cactus juice is used as an adhesive with or without the addition of other glues.

**Softening leather, celluloid, etc.** G. L. ALLINSON. Brit. 151,744, July 5, 1919. In a machine for softening stiffeners made of celluloid, leather-fiber, etc., used in the manuf. of boots, corner pieces, etc., of bags and dressing cases, toys, and other articles where such softening is required, the article to be softened is held in a clip in one of the compartments of a metal drum rotated in a closed tank containing steam, hot or cold  $\text{H}_2\text{O}$ , acetone, or other softening agent. The tank is entirely closed to prevent escape of vapors, etc., but access to the tank is obtained by a felt-lined lid. Escape of gas, etc., through the sides of the drum is prevented by layers of felt, asbestos, etc., pressed against the drum by metal plates and springs. The upper cylindrical part of the drum is similarly covered with felt, etc., plates, etc.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Decolorization of glass by metallic selenium.** SABURÔ TSUBOI. Dainihon Yôgyô Kyôkwai Zasshi. *J. Soc. Jap. Ceram.* 338, 44-7(1920).—By addition of 0.003-0.005 Se to 5000 soda glass, the latter is tinged with a beautiful rose color splendid in transparency. Fifty parts of glass are decolorized by 0.02  $\text{As}_2\text{O}_3$ , 0.003 Se, and 0.001 Co flint, without leaving any dark shades. The color does not change on annealing. K. K.

**Sharp fire colors for porcelain.** W. FUNK. Meissen. *Ber. deut. Keram. Ges.* 1, Pt. 1, 24(1920).—Colors for hard porcelain are discussed. Brief reference is made to the use of some of the rarer materials; such as  $\text{Nd}_2\text{PO}_4$  for violet,  $\text{H}_2\text{WO}_4$  with Fe and Mn for browns,  $\text{Pr}_2\text{PO}_4$  for light transparent greens, and the doubtful value of  $\text{Nd}_2\text{O}_3$  and  $\text{H}_2\text{WO}_4$  for underglaze red colors. No formulas or recipes are given.

C. W. PARMESER

**Suspension type of transmission line (porcelain) insulators.** ALFRED STILL. *Elec. Rev.* 78, 135-8(1921); cf. *C. A.* 15, 472.—This instalment covers the design and construction of porcelain suspension insulators; discussion of advantages of thick porcelain in suspension insulators, etc. C. G. F.

**Manufacture of spark plugs.** ANON. *Clayworker* 73, 324-6(1920).—The process used by the Champion Ignit. Co. is described. Eleven domestic clays are used. The mixt. is blunged, filter-pressed and kneaded. A throwing machine forces the clay

through a small cylinder slightly larger than the plug after which the cylinders are baked in revolving ovens. The cylinders are then turned down, threaded, dried and glazed. The center wire is cut off and welded to the head. The threads are then cemented, the center wire is screwed into place and the porcelain is again baked to harden the cement. To insure against leaks an asbestos gasket enclosed in a thin shell of copper is placed at the lower shoulder of the porcelain flange. H. G. S.

**A new material for crucibles.** ANON. *Brit. Clayworker* 29, 204(1920).—The new bodies are made by adding bituminous or oil shale to clay. Other material containing volatile C which is decomposed upon heating may be used. Such a mixt. is embedded in oil shale or coke to maintain reducing conditions and baked at 700–800°. If the product is then fired to 1600° it becomes hard and resistant to acids and may be ground and used as an abrasive. Biscuit ware may be satd. with liquid hydrocarbons and fired under reducing conditions so as to produce a similar product. The material differs from plumbago crucibles, C bricks, and the like, inasmuch as the clay is satd. with minute particles of C. These particles may be sealed in the clay by firing until the necessary degree of vitrification has been reached, and by this means they may be completely protected from being burned away. H. G. S.

**Ceramic applications of the electro-osmosis process.** FELIX SINGER. *Ber. Tech.-Wiss. Abt. Ver. keram. Gewerke in Deutschland* 5, Pt. 5, 16–22(1919).—A kaolin is obtained by this process of much higher purity than the usual washed kaolin, and its use in a body insures freedom from casting flaws, caused by the impurities, principally mica, in ordinary purified kaolin. E. N. BUNTING

**The utilization of heat from cooling kilns.** R. RIEKE. *Ber. deut. keram. Ges.* 1, Pt. 1, 36–8(1920).—Fuel can be saved by using waste heat to warm working or drying rooms. E. N. BUNTING

**Transferring designs to ceramic ware.** WILHELM SCHERTEL. *Ber. Tech.-wiss. Abt. Ver. keram. Gewerke in Deutschland* 5, Pt. 5, 34–40(1919).—Usually the lithographic method is used, although relief printing is also practised. Many problems await solution. E. N. BUNTING

**Instruction in ceramics in the technical high school at Charlottenburg.** ANON. *Ber. deut. keram. Ges.* 1, Pt. 1, 38–40(1920). E. N. BUNTING

**Prize awards of the German Ceramic Society.** M. HEINE. *Bonn. Ber. deut. keram. Ges.* 1, Pt. 1, 7–23(1920).—Due to shortage in cotton cloth during the war, prizes were offered in 1918 for new methods of preparing clay slips, using little or no filter cloth. Centrifuge methods were found useless, as the constituents of a mixt. separated and the resulting mass was not homogeneous. Suction filters also could not be used, as only a thin layer separated which became so dense that the process soon stopped. The electro-osmosis process was too expensive and could not be installed in a short time. First prize was awarded a filter press app. using thin metal disks clamped together as filter plate. Second prize was given to a filter cloth of specially woven paper material. Third prize, porous plates made of porous material, one of coarse-grained, another of fine-grained structure, usable in ordinary forms of filter presses. Fourth prize, the method of sieving and dry grinding before mixing with a suitable amount of water in a pug mill. Other methods, some of which are continuous, could not be considered because they could not be used for lack of coal. E. N. BUNTING

**Normal colors and harmony of colors.** W. OSTWALD. *Keram. Rund.* 28, 447 (1921).—O.'s new laws of color are claimed to systematize the innumerable color possibilities and permit of classification. The Meissen Porcelain Works have used the tables for some time for the prepn. of harmonic colors. Wm. H. CLARK

**Gas in the enameling industry.** J. H. GUMZ. *Gas Record* Dec. 22, 1920.—A muffle type furnace is essential with coal as fuel, or even with gas or oil when the surface combustion or intermittent firing plan is not used. Cross sections of the various

types of furnaces are shown. Firing costs (a) without and (b) with recuperation are: direct-fired gas, (a) 1.0, (b) 0.8; semi-muffle gas, (a) 1.4, (b) 1.1; oil-fired muffle, (a) 1.5, (b) 1.2; full muffle, (a) 1.6, (b) 1.2; coal-fired muffle, (a) 1.7, (b) 1.3; electric direct, (b) 1.4 cents per cu ft. oven space per hr. Further savings result from applying flue gases in waste-heat boilers and dry rooms. Many advantages are claimed for the direct-fired gas furnace.

R. R. DANIELSON

Thermal conductivity of some solid insulators (CLARKE) 2. Transmission and refraction data on standard lens and prism material (COBLENTZ) 3.

**Glass.** L. E. BARTON and H. A. GARDNER. U. S. 1,362,917, Dec. 21. At least 25% of titanic oxide is used in glass in order to produce a transparent uniform and readily workable product. The glass batch may be formed of  $\text{SiO}_2$  24-69, borax 10,  $\text{Na}_2\text{CO}_3$  29, lime 7 and  $\text{TiO}_2$  15-45 parts.

**Decorated pottery.** A. P. MORRIS. U. S. 1,362,956, Dec. 21. "Burmese black" pottery is figured by removing the C blackening by oxidation over selected portions of the surface of the ware, to expose the natural color of the clay.

**Building brick.** F. ORTH. U. S. 1,363,264, Dec. 28. In forming building bricks, an aggregate of silica material in graded sizes down to 40 mesh proportioned so as to secure a minimum of voids is mixed with 2-5% of calcined and hydrated lime, the mixt. is molded and treated with steam under 125 lbs. pressure per sq. in. for 10 hrs. and is then burned for about 8 days at a temp of about 1600°.

**Abrasive adapted for use in molded forms.** A. H. ANDERSON. U. S. 1,364,849, Jan. 4. A compn. adapted for various uses as an abrasive is formed of cryst.  $\text{Al}_2\text{O}_3$  or other abrasive particles united by a binder of feldspar, ball clay, flint and slip clay.

## 20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILBY

The use of volcanic slag in concrete to save cement. H. SACHSE. *Tonind.-Ztg.* 44, 831-33(1920).—C. Platzmann (*Zement* 19, 227) used slag as follows: 1 cement;  $\frac{1}{2}$ -1 slag; 4-11 sand. The volcanic slag used had the following compn:  $\text{SiO}_2$ , 56.4;  $\text{Al}_2\text{O}_3$  +  $\text{Fe}_2\text{O}_3$ , 22.58;  $\text{CaO}$ , 2.71;  $\text{MgO}$ , 1.43;  $\text{SO}_3$ , trace;  $\text{Na}_2\text{O}$  +  $\text{K}_2\text{O}$ , 7.94; hygro.  $\text{H}_2\text{O}$ , 2.83; chem.  $\text{H}_2\text{O}$ , 6.47%. P. found that by using finely ground slag or sand with cement the compressive strength is increased and less cement is required. Similar results can be obtained with finely ground brick dust or blast furnace slag. By the fine grinding, silicic acid is formed which combines with free  $\text{CaO}$  present forming  $\text{CaSiO}_3$ . If no free  $\text{CaO}$  is present no bonding results and the slag weakens the concrete. S. suggests the addition of  $\text{CaO}$  to cements together with finely ground slag to obtain the max. bonding.

H. G. SCHURECHT

Tests of bond resistance between concrete and steel. W. A. SLATER, F. E. RICHARD and G. G. SCOFIELD. Bur. Standards, *Tech. Paper* 173, 66 pp.(1920).—Record of tests made by Emergency Fleet Corporation in connection with construction of concrete ships. Results are principally of interest to designing engineers but a study of the different coatings used to prevent corrosion of reinforcing steel has some interest to chemists.

C. N. WILBY

Plaster of Paris as putty. G. ATTERBERG. *Tonind.-Ztg.* 44, 871(1920).—Most of the war substitutes were unsatisfactory because the chemicals attacked the hands. Plaster of Paris may be used in the place of these by adding sufficient lime to retard the set considerably.

H. G. SCHURECHT

The recovery of waste roofing felt. OTTO KRHS and L. F. HAWLEY. *Paper*

*Industry 2*, 1387-90(1920).—The pitch from roofing felt is extd. with gasoline and recovered for use with the fibrous content converted into a new felt sheet.

H. H. HARRISON

**Cement mixture.** E. R. STOWELL. U. S. 1,364,004, Dec. 28. A mixt. adapted for manuf. of light brick or tile is formed of coal ashes 50, Na silicate 12, ground talc 8-10 and port. cement 5-10 parts. The mixt. may be used as a plaster or floor covering.

**Making portland cement.** R. W. LESLEY. Brit. 152,106, July 4, 1919. The hot waste gases from a rotary cement kiln are used to heat retorts containing low-grade carboniferous materials such as oil shale, lignite, low-grade bituminous or cannel coal, etc. The volatile products from the retorts may be passed along a pipe and burned in the kilns or may be used for other purposes, and the ash or residue is added to the calcareous or other ingredients and submitted to the clinkering process, the C in the residue forming a part at least of the fuel required in the process. The ash or residue from the retorts is carried by a conveyor to a hopper to which the cement-making materials are supplied, and the mixt. is passed therefrom into the kilns. The kilns are heated initially by fuel supplied by a pipe. Cf. 11,618, 1891.

**Artificial marble.** D. JAGER. Brit. 152,359, Oct. 14, 1920. Artificial marble is produced by making several sep. mixts. of different colors and consistency, superimposing the mixts. in layers, and stirring them together with or without shaking in such a manner as to avoid complete mixing. A dry mixt. of 1 part port. cement,  $\frac{1}{2}$  part Ag sand, and  $\frac{1}{2}$  part pulverized marble is moistened with  $H_2O$  to which is added coloring matter free from  $H_2SO_4$  to form a comparatively thick mortar. "Flame markings" are produced by mixing a similar compn. of different color with a larger proportion of  $H_2O$ , and the compn. for veins, with less  $H_2O$ . These mixts. are superimposed, and turned over with a trowel or the like to mingle the colors. The mass is then shaken in molds without compression, and after drying, the face layer is ground off. For reinforced concrete, the marble mass is placed in the mold, and while still moist, the reinforced concrete is superimposed.

**"Artificial stone."** M. JUNGHANDEL. U. S. 1,363,879, Dec. 28. Cement is mixed with an aggregate of elastic, capsular material such as calcined rice hulls in order to form a material suitable for building purposes having good insulating properties against heat and sound.

**Coloring cement surfaces.** L. A. and A. J. SANDERS. U. S. 1,364,587, Jan. 4. Surfaces comprizing hydraulic cement and rendered alk. by the presence of lime are colored by treatment with an aq. soln. of a sulfate or other salt of Cu, Fe, Zn, Ni or Pb.

**Sheet material for use in building.** T. J. MULLIN. U. S. 1,362,888, Dec. 21. A multi-ply material suitable for use as a siding for outside building construction is formed of waterproof wallboard, asphalt, felt or similar material and ground stone secured together.

**Building block.** F. J. KRAMER. U. S. 1,363,045, Dec. 21. A mixt. for making building blocks is formed of pulverized furnace slag 79.8, cement 20,  $KMnO_4$  0.175 and HF 0.025% mixed with  $H_2O$ . The  $KMnO_4$  facilitates hardening and the HF prevents discoloration.

**Pavement.** J. R. DRANEY. U. S. 1,364,620, Jan. 4. A pavement or roadbed is formed of a foundation of oxidized asphalt from Mexican petroleum and mineral aggregate and a surface layer composed of non-oxidized asphalt and aggregate.

**Paving material.** J. E. CLARK. U. S. 1,364,037, Dec. 28. Wet fibrous material such as cooked straw or cornstalks is passed through a vat containing hot asphalt or a similar binder and preservative to convert the moisture into steam and impregnate the material with the binder and preservative. Asbestos may be added.

**Paving material.** J. R. DRANEY. U. S. 1,364,621, Jan. 4. A paving material

is formed of a binder of "blown" or oxidized asphalt mixed with an aggregate of slag of graded sizes a portion of which is in pulverized form.

**Paving material.** J. R. DRANEY and I. M. LAW. U. S. 1,364,622, Jan. 4. Elec. pptd. flue dust from mineral-reducing plants is used with a bituminous binder as a paving material.

**Road-making materials.** C. HONDA. Brit. 151,852, Nov. 15, 1919. A road-making or paving material applicable as an asphalt substitute is prepd. by mixing tarry matter with NaCl, and adding resin which has been saponified and sulfuretted by fusion with slaked CaO and S. Clay may be added.

**Coloring wood.** R. E. SLADE. Brit. 152,427, July 14, 1919. In coloring wood black or gray by means of a soln. of Fe and a soln. of tannin, the wood is dried between the successive impregnations and is finally treated with  $\text{NH}_3$  or other alkali. Log-wood ext. may be used instead of, or in addition to, tannin, to modify the color. Impregnation may be effected with the aid of vacuum and pressure, and the process may be carried out in the cold or with the application of heat.

**Roofing.** R. E. MOIST. U. S. 1,362,887, Dec. 21. A roofing material resistant to hail is formed of woven-wire reinforcing material combined with a fabric comprizing cotton, wool, linen, silk, asbestos, wood pulp, rubber and asphalt.

**Roofing material.** A. I. CLAPP. U. S. 1,362,850, Dec. 21. A sheet material adapted for use as roofing is formed of rag fiber, disintegrated leather fiber or other bulky filler such as tanbark waste and a waterproofing material such as asphalt or pitch filling the pores and interstices of the material.

## 21—FUELS, GAS, TAR AND COKE

J. D. PENNOCK

**Fuel conservation, present and future.** HORACE C. PORTER. *J. Ind. Eng. Chem.* 13, 47-51(1921).—Brief statistics are given regarding our production and consumption of fuel, especially of coal. An interesting table of suggestions as to possible means of coal conservation in the different classes of consumption, is given. Present fuel conditions are discussed with reference to boiler furnace efficiency, railway, locomotive operation, industrial heating furnaces, waste-heat boilers, gas-engine-driven power stations, reclamation of waste coal, and domestic utilization. The future possibilities of the electrification of railroads and the centralization of power systems are pointed out. The bearing of lower gas standards is discussed and colloidal fuel (so-called) is mentioned.

ARTHUR G. WILLIAMS

**Some factors affecting the sulfur content of coke and gas in the carbonization of coal.** ALFRED R. POWELL. *J. Ind. Eng. Chem.* 13, 33-5(1921).—The primary behavior during carbonization of the org., the pyritic, and the sulfate sulfur of coal is discussed. Likewise the secondary reactions of the S during carbonization are pointed out. Especial emphasis is laid on an observed desulfurizing action of H and by-product coke-oven gas purified from S when passed over heated coke. The action is reversible and passage at suitable temp. of gas sufficiently S-laden actually increased the S in a coke to some extent. Possible commercial desulfurization of coke is touched upon.

ARTHUR G. WILLIAMS

**The distribution of the forms of sulfur in the coal bed.** H. F. YANCEY and THOMAS FRASER. *J. Ind. Eng. Chem.* 13, 35-7(1921).—Extreme irregularity of distribution is characteristic of the pyritic S of coal, while the distribution of the org. S in the vertical span of the bed is comparatively uniform. There is little evidence of a definite relationship in the occurrence of org. and of pyritic S. The proportion of org. S in various raw coals varies widely. High-S coals are ordinarily higher both in org. and in pyritic S than low-S coals, though org. S makes up a greater percentage of the total S in the case

of low-S coals. The org. S content of some coals is sufficiently high to limit seriously the extent to which these coals can be cleaned of S by washing. Ill. and Ky. coals were those investigated. Total S was detd. by the method of Eschka. Pyritic S was detd. according to the method of Powell with Parr. Org. S was obtained by difference, sulfate S being negligible.

ARTHUR G. WILLIAMS

Colloidal fuels, their preparation and properties. S. E. SHEPPARD. Research Laboratory, Eastman Kodak Co., Rochester, N. Y. *J. Ind. Eng. Chem.* 13, 37-47 (1921); cf. *C. A.* 14, 1026, 1027, 2406, 3313-4.—The article comprizes a discussion of colloids and of the properties of colloidal fuel, essentially, as far as that fuel is concerned, the material covered by the abstracts cited.

ARTHUR G. WILLIAMS

The case for colloidal fuel. LINDON W. BATES. *Chem. Age (London)* 3, 558-9 (1920); cf. *C. A.* 14, 1026, 1027, 2406, 3313-4, and the preceding abstract. The subject matter of this article is covered by the abstracts cited.

ARTHUR G. WILLIAMS

Storage of coal. O. P. HOOD. U. S. Bur. Mines. *Mining Sci. Press* 122, 121 (1921).—Undue attention has been given to the minor factors of S, height of pile, volatile matter, etc., and the main factors, such as initial temp., breakage in handling, freshness of coal, size of coal, and coal screening before storage, have been overlooked.

A. H. HELLER

Coal washing at the Northwest Experiment Station. E. R. McMILLAN. *Elec. Rev. (Chicago)* 78, 143-4 (1921).—Success of coal washing tests depends upon the difference in sp. gr. between clean coal and refuse and its object is to prevent loss of good coal in the removal of impurities and to devise methods easily and cheaply removing dirt, thus rendering coal suitable for commercial purposes. The sp. gr. of clean coal is 1.28-1.35 with the higher quality, in general, having the higher gravity. Raw coal contains bone, shale, and clay with sp. gr. of 1.35-2.65. The float- and sink-method was used to det. the proportions of clean coal and of the heavier impurities, as well as the relations between sp. gr. and ash content. Standardization was made by compiling the results of a long series of tests. In these tests the coal must be kept satd. with water. In one case the ash content was reduced from 30% to 17% with 75% recovery. Expts. are described that show how ash was reduced in another case from 24% to 16%, a recovery of 92% of washed coal obtained, and 25% of the refuse floated on 1.55 sp. gr.  $ZnCl_2$  soln. The loss of good coal in the refuse was reduced from 9.3% to 3.5% of the feed. A saving in cost and labor was effected.

W. H. BOYNTON

The industrial use of pulverized fuels. H. DROUOT. *Technique moderne* 12, 407-17, 476-9 (1920).—A review of the merits of pulverized coal, of the various systems devised for handling and feeding it (Holbeck, Quigley, Fuller, Bergman, Covert, Aéro, Stroud, Lopulco), and of the various uses to which it has been put (stationary boilers, waste-heat boilers, locomotives, metallurgical furnaces of all kinds, blast furnaces, roasting of Fe ores, marine boilers, and internal-combustion engines), together with a brief mention of pulverized lignite and pitch, and colloidal fuel.

A. P.-C.

Grindle system of burning powdered coal. ANON. *Iron Age* 106, 1614-5 (1920); cf. *Ibid.* 104, 444 (1919).—New features of the Grindle system, including conveying and control, are described.

J. L. W.

Pulverized coal an effective means of fuel economy. ANON. *Elec. Rev. (Chicago)* 78, 134 (1921).—A review. Fuels not available for other uses may be burned effectively in powdered form. Vast resources in low-grade coals become available.

C. G. F.

Pressure oxidation of products from lignite. WILHELM SCHNEIDER. *Mülheim. Brennstoff Chem.* 1, 70-2, 80-5 (1920).—Three constituents of lignite tar, viz., the tar oil, the paraffin and the montan wax, were submitted to oxidation with mol. O in the presence of dil.  $Na_2CO_3$  soln. The app. consisted of an iron autoclave, gas-heated, provided with a mechanical stirrer or agitated by the air current. The air or  $O_2$  passed through continuously, leaving through a pressure reflux condenser. The sampling pipe

was water-cooled. The sample of *tar oil* b. 200–300° was treated to remove phenols and solid paraffins, and then consisted of approx. 50% unsatd., 30–40% naphthalene and 10% paraffin hydrocarbons. When oxidized with air at 30 atm. pressure and 200° in the absence of  $\text{Na}_2\text{CO}_3$  soln., about half was pptd. as a solid asphalt, the remainder giving a light yellow distillate; in the presence of  $\text{Na}_2\text{CO}_3$  soln. on the other hand practically no solid product was formed, but an *alkali-sol. product* was obtained in a yield of 55%. The latter, when isolated, was a sirupy liquid, insol. in petr. ether,  $d_{20}$  greater than 1.0, hence was not a fatty acid, but appeared to be similar to Kharichkov's polynaphthenic acids. Study of the oxidation of *lignite paraffin*, of m. p. 53°, led to the following conclusions: (1) Deep-seated oxidation to very small mols. does not take place; (2) acids are formed almost exclusively—alcohols and aldehydes only in traces; (3) the acids are principally the monobasic fatty acids, their soly. in petr. ether indicating the absence of appreciable quantities of hydroxy acids; (4) dibasic acids, even oxalic, are formed only in minute proportions; (5) the mechanism seems to be the formation of acids of high mol. wt., loss of  $\text{CO}_2$ , reoxidation, and so on, forming the whole homologous series in turn. For investigation of the influence of exptl. conditions, expts. were made differing in only one detail each time from a "normal" expt., namely 200 g. paraffin + 800 cc. 2.5 N  $\text{Na}_2\text{CO}_3$  soln., 30 atm. pressure, 170°, and a flow of 200 liters of air per hr. Under the normal conditions, 141 g. of paraffin was used up, 46%  $\text{H}_2\text{O}$ -insol. fatty acids was formed, and the product had a mean mol. wt. of 271 and was brown in color. A temp. increase of 10° doubled the reaction velocity; since it shortened the time necessary, the yield of insol. fatty acids was better and their mol. wt. was higher, but the color was much darker at 180° than at 160°. The quantity of fatty acids formed at a given temp. was linear with respect to time. If the expt. was continued after the paraffin was used up, the Na salts first formed were broken down into  $\text{Na}_2\text{CO}_3$ . On increasing the wt. of paraffin, the yield of high-mol.-wt. fatty acids was better with regard to the paraffin used up, but lower referred to the total present; in one case a yield of 104% (theoretical 108%) was realized. The reaction velocity was found to be proportional to the  $\text{O}_2$  concn. With only one exception, namely a high-boiling fraction of a low-temp. tar from Rhenish lignite, paraffin from other sources—from peat, from low-temp. coal tar and from petroleum—behaved like the "standard" lignite paraffin. American *paraffin oil* gave liquid,  $\text{H}_2\text{O}$ -insol. acids. The use of  $\text{K}_2\text{CO}_3$  or  $\text{Ca}(\text{OH})_2$  showed no advantages, and  $\text{NaOH}$  gave lower yields and slower action. Salts of Fe, Cu and Mn accelerate the reaction, while salts of Ni, Co, Cr, Pb, Hg, Ce, Ti, V, and charcoal, have no effect; the iron walls of the vessel catalyze the reaction to some extent, and are largely responsible for the dark colors of some products. The single fatty acids, isolated as their esters, were found to be principally  $\text{C}_{14}\text{H}_{28}\text{O}_2$ ,  $\text{C}_{16}\text{H}_{32}\text{O}_2$ ,  $\text{C}_{17}\text{H}_{34}\text{O}_2$  and  $\text{C}_{19}\text{H}_{38}\text{O}_2$ . The latter was repeatedly fractionated by means of  $\text{Mg}(\text{OAc})_2$ , giving an acid m. only 0.5° lower than that given in the literature. Other O compds. were isolated from the alkali-insol. residue by their soly. in  $\text{Me}_2\text{CO}$ ; primary alcs., aldehydes and ketones were distinguished. The Na soaps sepd. directly from the reaction products had good lathering and detergent qualities. *Montan wax* is more difficultly attacked than paraffin, giving much smaller yields of  $\text{H}_2\text{O}$ -insol. acids, but those formed had higher m. ps.—69° and over; the difficulty is held to be that saponification of the esters must precede the oxidation, and the former is relatively the slower process.

W. B. V.

The extraction of montan wax from lignite. ED. DONATH. *Brennstoff Chem.* 1, 86–7(1920).— $\text{Me}_2\text{CO}$  is as good an extg. agent for montan wax as benzene, and has the advantage that high moisture content of the fuel does not prevent the extn.

W. B. V.

Wax and resin from brown coal. AD. GRÜN AND E. ULBRICH. *Z. deut. Öl-Fett-Ind.* 40, 773–5(1920).—Lab. expts. are described in which various types of brown coal

were extd. with benzene, toluene, xylene, or a mixt. of benzene-benzene before and after treating the ground coal at 100-120° for 1-2 hrs. with a by-product acid, containing dil. HF and H<sub>2</sub>SO<sub>4</sub>. Certain coals after the acid treatment yield a much greater amt. of bitumen, in some cases a 40% increase, indicating that the ash constituents of the coal are chem. combined with some of the bitumen. This was also proved by completely exhausting one coal at 100° in a soxhlet with a benzene-benzene mixt. by 5 extns., the 4th extn. yielding only 0.4% bitumen, with a total yield of 10% bitumen—and then subjecting the exhausted residue to the acid digestion for 3 hrs. After washing and drying the residue yielded a further 6.1% bitumen, a total of 16.1%. The acid no. and I no. of the acid-treated coals are higher. Further work to sep. the bitumens into their constituent waxes, resins and asphalt base is in progress.

P. ESCHER

The utilization of peat in industrial heating. HEYER. *Bergbau u. Hütte* 6(1920); *Brennstoff Chem.* 1, 89-91(1920).—Summary of an address by M. Dolch, reviewing modern technic in peat utilization—drying, briquetting, direct burning, coking and gasification in producers.

W. B. V.

Gas industry on the heat-unit basis. I. The genesis and development of the gas regulation act. D. M. WATSON. *Gas J.* 153, 23-6(1921).—A historical narrative. Economic value of the new act. THOS. GOULDEN. *Ibid* 26-7.—In the future a greater proportion of coke will be gasified simultaneously with the carbonization of the coal from which it is produced, and, the heat expended in the process of carbonization bearing so serious a proportion to the potential heat of the coal, some form of gas production will be developed in which the necessary heat will be mainly secured within the retort. II. Production of British thermal units. J. W. COBB. *Ibid* 89-90. Carbonization. H. J. HODSMAN. *Ibid* 90-1.—Changes made in carbonizing methods to reduce heat losses are sketched. Steaming, water gas, and complete gasification. A. PARKER. *Ibid* 91-2.—Recent developments are briefly discussed. Use of oxygen in gas production. H. J. HODSMAN. *Ibid* 92; cf. *C. A.* 14, 2408.—Utilization of B. t. u. in heating and lighting. J. W. WOOD. *Ibid* 93-4.—Typical cases of low, intermediate, and high temp. uses of gas are considered, as exemplified by water boiling, gas-fire heating and incandescent lighting.

J. L. WILEY

Catalytic methane from blue gas. M. MEREDITH. *Gas Age* 47, 7-8(1921).—A discussion is given of the possibility of enriching blue gas by converting it into CH<sub>4</sub> catalytically and mixing so as to produce a 400-B. t. u. gas. If water gas is passed over a Ni catalyst at about 450°, the CO is converted into CH<sub>4</sub> and CO<sub>2</sub> with deposition of a certain amt. of free C on the catalyst. When the latter becomes choked, it is maintained at 450° and a current of steam is blown through it, with formation of CO<sub>2</sub> and H. The former interacts to form CH<sub>4</sub>, so that the final mixt. consists of H, CH<sub>4</sub> and CO<sub>2</sub>. The 2 stages of the process may be combined by employing simultaneously suitable proportions of water gas and superheated steam. There are certain difficulties to be encountered; such as S compds, which poison quickly the catalyst, the serious reduction in gas production due to the requirement of 4 vols. of CO and H to yield 1 vol. of CH<sub>4</sub>, and the difficulty of avoiding the formation of nickel carbonyl. There are, however, possibilities in the process. The ash content of the fuel tends also to produce equilibrium in the water gas process, and both theory and practice point to the fact that the final gas mixt. obtained depends on the proportion of ash in the fuel. It has even been suggested that the proportion of CH<sub>4</sub> found in blue water gas is due to interaction between CO or CO<sub>2</sub> and H promoted by the ash acting catalytically.

J. L. WILEY

Chicago tests of water gas sets. C. E. REESE. *Gas Age* 47, 1-6(1921).—Williamson and Lowe types of water gas machines were tested for comparative efficiencies and yields. Results, as shown by a large amt. of tabulated data, compared very closely.

J. L. WILEY



**Remarks on the analysis of lignite tar oils.** AD. GRÜN AND E. ULBRICH. *Z. angew. Chem.* 33, I, 295-6(1920).—Certain lignite tar oils showed a much higher I number than the known content of olefins warranted. To find the cause a lignite tar oil from a Mond generator was studied. The hydrocarbons from this distd. completely with steam at 240-260°, and gave: Br corresponding to I number, 34.53%; by McIlheney's method: added Br, 11.06%; substituted Br, 48.78%. Hence  $\frac{1}{2}$  of the I was substituted either directly or by a secondary reaction. Detns. of the added and substituted Br in portions of the hydrocarbons after treatment with strong  $H_2SO_4$  and by formolite reaction showed that substitution took place both in the satd. hydrocarbons and the naphthalenes. This supplements the observation of Röderer (*C. A.* 15, 308) on the gradual absorption of I by lignite tar oils. The I numbers found are no guide to the amt. of unsatd. hydrocarbons. ERNEST W. THIELE

**Calorific power of coal tar.** ANON. *J. usines à gas* 44, 341-5(1920).—From a large number of tests to det. calorific value of tars, an av. is taken for coal tar of 8800 cal., for tar from vertical retorts, and coke ovens in certain cases, 8900-9000 cal., from low-temp. distn. of lignites 9200-9300 cal., and from distn. of petroleum oils as in carburetted water gas 10,000-10,200 cal. J. L. WILEY

**Low-temperature carbonization.** H. L. ARMSTRONG. *Gas World* 74, No. 1902 (Coking and By-products Sec.), 12-6(1921); *Chem. Trade J.* 67, 736(1920).—A. describes the Barnsley plant of the Low Temperature Carbonization, Ltd., which consists of 20 metal retorts, treating 50 to 70 tons of coal per day, and a by-product plant of 250 tons capacity. The retort plant is being extended. Yields per ton of coal are 70% by wt. of smokeless fuel, 16 gals. of oil, 3-4 gals. of motor spirit, 5000-7000 cu. ft. of rich gas and 15-20 lbs. of  $(NH_4)_2SO_4$ . The solid residue, called *coalite*, contains about 10% of volatile matter, is smokeless in combustion, free-burning, and is suitable for open fires, boiler fuel and metallurgical purposes. It is somewhat too soft for use in large blast furnaces but by mixing with a hard coke can be used in the smaller Scotch types. Practically every kind of coal within the limits of good coking coal and a non-coking coal was found possible of utilization. J. L. WILEY

**Retorts for low-temperature coal carbonization.** THOS. H. DAVIDSON. *Gas J.* 153, 37-8(1921).—A description of the retorts and process of the Low-Temperature Carbonization Co. Cf. preceding abstr. J. L. WILEY

**Low-temperature coking of Utah coals.** OSBORN MONNETT. *Chem. Met. Eng.* 23, 1246-9(1920).—As a source of supply of coke for domestic heating in Salt Lake City, to reduce smoke nuisance, low-temp. carbonization appears most promising, as there is less gas to dispose of, and the coke made is more suitable for domestic use. Fifteen Utah coals were examd., and 10 carbonized at 540° and 700° in 20 g. and 8-lb. lots in lab. app. which is illustrated and briefly described. Full tables are given showing analyses of coals and products of carbonization. Except for 2 whose coking qualities were well known, the coals examd. showed very doubtful coking value. ERNEST W. THIELE

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**Light, heat and power (SIMPSON) 22.** High-grade talc for gas burners (DILLER, *et al.* )8.

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**Liquid fuel.** A. HAYES. U. S. 1,363,870, Dec. 28. A fuel adapted for use in automobile engines is formed by passing alc. vapor into a mixt. of kerosene 50,  $C_6H_6$  14 and ether 3 parts.

**Production of fuels.** CHAS. LÉPRETIT. Can. 208,010, Jan. 25, 1921.

**Heating oil fuel.** W. J. MELLERSH-JACKSON. Brit. 151,874, Jan. 2, 1920. In app. for heating oil fuel of the kind wherein the oil is passed through coils heated by boiler steam and the pipe joints are all external to the heating chamber, the straight

ends of the three coils pass through thimbles screwed into the casing. A suitable construction is specified.

**Peat fuel.** N. DE LONG. Brit. 152,515, Oct. 11, 1919. Alkali is added to peat during its treatment in a mixing machine, and the resulting product is left to dry in the air; preferably, the product is made up into blocks before being dried. The alkali is of a kind that will attack the water-holding cells of the peat without combining with the cell water and may be washing soda,  $K_2CO_3$ , borax, or like material.

**Utilization of peat.** N. TESTRUP. Can. 207,257, Jan. 4, 1921. Peat is subjected to heat under pressure sufficient to prevent evapn. to destroy its water-binding and develop its acid properties. Part of the peat may then be used for the production of  $NH_3$  and the rest for the absorption of the  $NH_3$  thus formed and used as a *fertiliser*.

**Cleaning coal and the like.** H. R. CONKLIN. Can. 207,812, Jan. 25, 1921. Coal is sepd. from heavier impurities by introducing the raw coal into a quiescent suspension of water and finely ground rock, ground to a fineness to remain in suspension, without agitation during the sepn. of the coal, the suspension being substantially free from colloidal ingredients and removing the coal from the surface of the suspension.

**Separating coal, etc., from ashes.** F. KRUPP AKT.-GES. GRUSONWERK. Brit. 152,642, Aug. 23, 1920. Addition to 150,333. The slag obtained from the process described in the principal patent is ground up and subjected again to the same treatment, whereby the fuel still enclosed in the slag is obtained as a non-magnetic material.

**Furnaces.** H. STRACHE. Brit. 152,668, Oct. 19, 1920. A process and app. for the combustion of fuel in furnaces with the recovery of by-products consists in supplying the fuel to the furnace through one or more pipes, chambers or passages in which the fuel is coked and gasified by the heat from the furnace, the coke being fed onto the furnace grate and the gases withdrawn from the coking chambers mixed, if desired, with combustion products and delivered to app. for sepg. the by-products, the residual gases being returned to the furnace. A suitable app. is specified.

**Producer gas in the manufacture of cyanides.** R. FRANCHOT. U. S. 1,364,838, Jan. 4. Producer gas is formed at a temp. sufficiently high to slag ash components of the fuel, and the gas is led, at the high temp. of formation, into contact with shaped masses of alkali carbonate, Fe and C, containing a relatively small proportion of carbonate, *e. g.*, a mixt. formed of Fe, coke and  $Na_2CO_3$ , in order to produce NaCN.

**Illuminating gas from lignite.** E. P. SCHOCH. U. S. 1,364,455, Jan. 4. Lignite is subjected to distn. until the % of  $CO_2$  evolved with the other gases shows a marked decrease, all the gases produced are collected and the  $CO_2$  is removed from the gas by treatment with  $K_2CO_3$  soln. to obtain a gas suitable for general city use.

**Sampling water gas.** R. A. CARTER, JR. U. S. 1,364,035, Dec. 28. Water gas is passed through a wash box and the difference in pressure on the two sides of the wash box is utilized automatically to control the passage of a sample of gas through a tap. A sample of the gas is passed at uniform pressure through the tap, a greater quantity of the sample gas being passed through the tap automatically when the pressure in the main rises and a smaller amt. when the pressure falls. The sample of gas is subjected to condensation and purification to obtain a representative sample of the gas. Tests carried out in this manner facilitate proper regulation of conditions within the gas-generating app.

**Gas producers.** JNO. WELLS. Can. 207,190, Jan. 4, 1921. The producer is divided into upper and lower compartments by a transverse plate having an aperture from which a bell or cone extends into the lower compartment. The upper compartment acts as a hopper from which fuel is fed through the cone to the lower compartment which forms the producer chamber.

**Gas producers.** JNO. WELLS. Can. 207,191, Jan. 4, 1921. A water-jacketed producer has tuyères extending from an air manifold to the inner shell, a connection

between the upper end of the water jacket and the manifold and means for forcing air through the manifold.

**Retort for producing gas from straw or similar vegetable materials.** B. R. PFEIFFER. U. S. 1,364,801, Jan. 4.

**Apparatus for separating suspended impurities from producer gas.** V. L. CAZES. U. S. 1,364,832, Jan. 4.

**Safety gas filter for gas producers.** V. L. CAZES. U. S. 1,364,833, Jan. 4. The device comprizes a filter, cooler and drier adapted for preventing back-firing of gas supplied from a producer to an automobile engine.

**Ash remover for gas producers.** F. HELLER and A. HARTELT. U. S. 1,363,116, Dec. 21.

**Suction gas plants.** WM. HART. Can. 207,118, Jan. 4, 1921.

**Valve for gas generators.** J. LEVEY. U. S. 1,363,047, Dec. 21.

**Benzene.** G. STEPHENSON. Brit. 152,054, May 2, 1919. In the recovery of  $C_6H_6$  and its homologs by means of steam distn. from the acid sludge produced in the purification of crude benzene, the vapors carried over by the steam are subjected to the action of a jet or spray of  $NH_3$  in order to arrest the acid impurities. Steam is passed through the acid sludge contained in a retort and escapes along with the benzene vapor through an outlet pipe in the head of the retort, where the vapors are met by a jet of  $NH_3$  or a spray of  $(NH_4)_2CO_3$  soln. introduced through a pipe. The purified vapors then pass through a scrubber, in which any excess of  $NH_3$  is removed by means of dil. acid, to a condenser, the benzene being finally sepd. into a suitable vessel.

**Purifying crude benzene, etc.** SOUTH METROPOLITAN GAS CO. Brit. 152,470, Aug. 16, 1919. S compds. are removed from benzene and other light oils by treatment at 30–90° with  $H_2SO_4$  of 60–85% strength, as by boiling the oil with acid of 73–82% strength, or by passing the oil vapor through acid of 70% strength at 84°. In an example, 500 gals. motor benzene are agitated with 50 gals. acid of 82% strength for about 2 hrs. at 83° in a sulfonator fitted with a reflux condenser, and the purified benzene sepd. by distn. or gravity.

**Purifying waste liquids.** KOPPERS CO. Brit. 152,356, Oct. 13, 1920. Waste liquors containing phenoloid compds, *e. g.*, waste liquors from  $NH_3$  stills, are filtered through peat. Preliminary treatment may comprize aeration, sepn. of solids by settling, filtration through slag or other inorg. substance, which may contain  $FeO$ , and treatment with ferrous and cupric sulfate to remove cyanogen compds. The liquor may be passed finally through a filter bed of earth. Cf. C. A. 14, 1894.

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**Papuan natural petroleum. II.** J. READ and A. C. P. ANDREWS. *J. Soc. Chem. Ind.* 39, 289–91T(1920); cf. C. A. 13, 2126, 2757.—The Papuan natural petroleum was further examd., especially with regard to the higher-boiling fractions. The  $d_{20}$  of the crude was 0.7965;  $n_D^{20} = 1.4489$ . Distn. from an ordinary flask yielded 44.65% by wt. up to 180°. The residue had a  $d_{20}$  of 0.831;  $n_D^{20} = 1.4645$ . This residue was fractionated, partly under atm. pressure, and partly under reduced pressure. Fraction  $b_{18}$  190–200° had a dextrorotation of 0.05° (2 dm. tube); fraction  $b_{18}$  200–225° a dextrorotation of 0.10° (2 dm. tube); fraction  $b_{18}$  225–255° was also probably dextrorotatory. This weak optical activity suggests an org. origin. From certain fractions *normal tricosane*, *normal pentacosane*, and *normal heptacosane* were isolated and identified. Among the leading features of this petroleum are absence of pronounced color or odor in the original oil and in the various fractions; absence of S and N; the low original specific gravity. Connected with the last feature are the unusually high yield of low-

boiling distillates and the small proportion of high-boiling residuals afforded by the oil, the "benzene" fraction (to 150°) amounting to 36% and the "kerosene" fraction (150–300°) to 46% by weight of the crude oil. Chemically, Papuan petroleum consists largely of paraffin hydrocarbons, not only with aromatic hydrocarbons, but also with other cyclic hydrocarbons, as is indicated by the high physical consts. exhibited by the residues from nitration processes.

ARTHUR G. WILLIAMS

**The combustion process in oil engines.** O. ALT. *Z. Ver. deut. Ing.* 64, 637–43 (1920).—The underlying principles with regard to injection, gasification, ignition, and combustion, for oil engines, are discussed. There is a criticism of the new injection processes of Vickers and Steinbecker without compressed air. Also are discussed vaporization and pyrogenic decompn. of the various fuels and the influence of compression on self-ignition.

ARTHUR G. WILLIAMS

**Fuel oil in Diesel engines.** C. J. HAWKES. *Engineering* 110, 749–52, 786–8 (1920).—Details are given of expts. in connection with both the solid-injection and air-injection systems and the combustion of fuel oil in Diesel engines. The fuel oil used was shale oil having a viscosity of 43 sec. at 70° F. In the case of solid injection the best and most economical results were obtained with a sprayer having five 0.016-in. holes, equally spaced. It is found that a greater variety of fuel oils can be used satisfactorily with air injection than with solid injection. The consumption per b. h. p. is the same with both systems but the consumption per indicated h. p. is less with the former than with the latter. This difference is probably due to the better and more rapid distribution of the fuel oil mist in the compressor space. It is also found that the solid injection engine starts more readily from the cold condition than the air injection engine, although much depends on the compression ratio and on the type of sprayer employed.

J. L. WILBY

**The Labarge, Big Piney and Dry Piney oil fields.** HENRY P. CRITTENDEN. *Salt Lake Mining Rev.* 21, No. 20, 21–6 (1920).—These fields, which have given a very high-grade oil, are through further development being merged into one. History of the field, together with a good geological account and complete analysis of various oils from this field, is given.

A. H. HELLER

**Refining problems of the petroleum industry.** H. H. HILL. *Chem. Age (N. Y.)* 28, 425–427 (1920).—The types of refineries are: Topping plants, skimming plants, complete refineries and refineries with cracking plants. The av. end-point of gasoline marketed in 7 large cities is now 456° F. The refiner who wishes to cut deeper into his crude for gasoline has the problem of obtaining additional supplies of casing-head gasoline. Increased yield of gasoline may be secured by (a) use of fractionating towers; (b) recovery from uncondensed still vapors and (c) the development of cracking processes, especially for use with residual oils. Kerosenes are becoming more difficult to treat and to prep. of proper viscosity for good service in ordinary wick burners. The manuf. of cylinder stocks from crudes other than Appalachian is an important problem. Problems in connection with fuel oils are (a) need of methods of reducing S content of high-S oils, (b) method of reducing the viscosity of heavier fuel oils. Some of the miscellaneous problems are fuel economy, improved insulation, improvement of treating methods, increased efficiency in filtration, methods of breaking up emulsions, recovery of H<sub>2</sub>SO<sub>4</sub>, and by-products from still gases and acid sludge.

F. W. PADGETT

**Corrosion prevention in petroleum-refining vapor systems.** RALPH R. MATHEWS AND P. A. CROSBY. *Chem. Met. Eng.* 23, 1122–3 (1920).—Ammonia is utilized to neutralize the HCl formed during distn. due to hydrolysis of MgCl<sub>2</sub> present in the crude (Cf. C. A. 14, 1752). The anhydrous NH<sub>3</sub> was added to the vapor line between the stills and the dephlegmators through a regulating valve and the amount was regulated so that the water in receiving house had odor of ammonia or was slightly alkaline. The amount of corrosion was materially reduced, but salt incrustations were produced in the vapor

systems. When  $\text{NH}_3$  was used the tubular condenser operated 280 days before any tubes had to be replaced compared with 100 days when  $\text{NH}_3$  was not used. Aq. soln. of  $\text{NH}_3$  will probably be used exclusively in the future. Soda ash soln. added directly to the oil involved mechanical difficulties and did not effect complete neutralization. Expense for  $\text{NH}_3$  when using Mid-Continent crude should not be over \$0.005 per bbl.

F. W. PADGETT

**Light, heat and power.** LOUIS SIMPSON. *Can. Chem. J.* 4, 297-8, 327-9(1920).—S. compares the fuel values of coal and oil and concludes that shale oil from Canadian shale deposits would be an economic and advantageous substitute for coal. The Scotch type of retort is, however, not suitable for Canadian conditions, therefore some specially designed type must be perfected. Cf. *C. A.* 14, 1187. J. L. WILEY

**Review of the progress of the oil shale industry in 1920.** V. C. ALDERSON. Col. School of Mines. *Am. Gas Eng. J.* 114, 69-71, 79-81(1921).—A review of foreign as well as U. S. operations. Cf. *C. A.* 14, 1753, 3526. J. L. WILEY

**Oil shale and the engineer.** DAVID E. DAY. *Eng. Mining J.* 110, 1182-3(1920).—A discussion of (1) economics of the shale oil industry as applied to American development; (2) exploration of oil shale property; (3) the evaluation of oil shale and (4) the technology of oil shale and shale oil in relation to American deposits. (1) A company must have sufficient funds to carry on extended research and must have an experienced staff of high-grade engineers. (2) Except in preliminary examn. the only trustworthy method of complete sampling is core drilling. In Colo. and Utah three drill holes should prove 500 acres. (3) By analyzing samples representing every 5 ft. of the core the number of commercial shale beds, thickness, relation to overburden, total tonnage of rich shale, and total recoverable oil from tonnage, may be estd. (4) The majority of proposed processes lack sound technical fundamentals and have been an attempt to evolve something radically new rather than to adapt or improve some furnace already proved. The products from shale oil are different from, but not greatly inferior or superior to, those from ordinary petroleum. Shale-oil lubricants, although satisfactory for many purposes, cannot fill the place of steam cylinder oils. The gasoline is unsatd. but better methods of refining are being developed. F. W. PADGETT

**Oil shales of Indiana.** JOHN R. REEVES. *Indiana Geol. Surv., Eng. Mining J.* 110, 954-5(1920).—The shales are advantageously located and homogeneous in structure. Commercial development is expected later on. Results are given of dry and steam distn. tests. The New Albany shale of Mississippian and Devonian Ages covers 500 sq. miles in Floyd, Clark, Scott, Jefferson, Jennings and Jackson counties. Samples collected in 1919 were tested by the Woodruff and Day app. (*U. S. Geol. Survey Bull.* 641). The results which follow were taken at random. *Indiana shale distd. with steam.* Gals. oil per ton 10, 12.75, 18.00, 9.50, 9.50, 16.50, 12.00; cu. ft. gas per ton 997, 912, 1836, 570, 886, 1350, 980; lbs.  $(\text{NH}_4)_2\text{SO}_4$  28.5, 22.2, 20.4, 38.4, 35.5, 22.4, 24.0; % fixed C 6.25, 8.50, 6.90, 8.00, 4.00, 7.90, 8.30; % volatile hydrocarbons 12.84, 13.14, 22.81, 10.90, 9.50, 18.00, 10.40; % ash 80.91, 78.36, 70.29, 81.10, 86.10, 76.40, 81.30. *Dry distn. yields.* Gals. oil per ton, 12 to 30; gals. ammoniacal liquor per ton, 6 to 16. The shale is uniformly soft. Low-temp. burning is sufficient.  $\text{K}_2\text{O}$  is extd. by  $\text{H}_2\text{O}$ . No caking occurs in the retort. Oil yield is low, but the shale is easily worked. JAS. O. HANDY

**The distillation of Waikaia oil shale.** W. DONOVAN AND G. C. BURTON. *Trans. & Proc. New Zealand Inst.* 52, 27-9(1920).—Waikaia shale distd. in the Dominion Lab., New Zealand, yielded per long ton: 38 gals. (Br.) crude oil;  $(\text{NH}_4)_2\text{SO}_4$ , 8 lbs.; gas, 3,250 cu. ft. after removing  $\text{CO}_2$ . The oil contained only 6.6% of light oil (naphtha). L. E. GILSON

**The relation between the charcoal yield of a charcoal pit and the composition of the pit gases during carbonization.** PETER KLASON. Stockholm. *Brennstoff*

*Chem.* 1, 79-80(1920).—The av. compn. of the gases from a charcoal pit operating at a temp. of about 500° was CO<sub>2</sub> 25.6, CO 9.8, CH<sub>4</sub> + H<sub>2</sub> 9.7, N<sub>2</sub> 54.9 vol. %. It is shown that the yield of charcoal increases with the % CO<sub>2</sub> in the gases, being 19% by wt. when CO<sub>2</sub> = 22.4% and 29% when CO<sub>2</sub> = 28.6%. W. B. V.

Dispersion by refraction of hydrocarbons (DARMOIS) 2.

**Cracking petroleum oils.** J. W. LEWIS. U. S. 1,364,443, Jan. 4. After cracking petroleum oils under pressure, condensation is effected at a pressure above atm. pressure but substantially below that maintained in the cracking zone. By placement of a pressure-reducing valve at the outlet leading from the still to the condenser, uniform operation of the still is facilitated.

**Gasoline from natural gas.** G. H. TABER, JR. U. S. 1,363,487, Dec. 28. Gas carrying gasoline is in part led off from a container under sufficiently high pressure (less than that under which it is drawn from the well) that gasoline is not vaporized and in part is released at a lower pressure at which gasoline vaporizes and the second portion is treated to recover the vaporized gasoline from it.

**Acetic acid; methanol; acetone.** J. C. ROBERTS. Brit. 152,420, July 14, 1919. In order to recover the HOAc, MeOH and acetone formed by the destructive distn. of wood in suction gas plants, the wash water from the suction gas scrubbers is passed over chalk or BaCO<sub>3</sub> until a sufficient concn. of acetate is obtained, and at the same time the MeOH and acetone are withdrawn by means of vacuum. The wash water contained in the tank is pumped into the vessel provided with a heating jacket, where it passes through lumps of CaCO<sub>3</sub> or BaCO<sub>3</sub>, and overflows through a pipe into the vessel which also contains CaCO<sub>3</sub> or BaCO<sub>3</sub> and is fitted with a cooling jacket. The MeOH and acetone are drawn off from the heated wash water in the vessel by means of a pump into a condensing coil. The liquid issuing from the vessel is pumped into the tank, from which it can be run back to the scrubbers of the suction gas plant. The process is repeated until the content of Ca or Ba acetate is sufficient to justify its recovery by evapn.

## 23—CELLULOSE AND PAPER

A. D. LITTLE

**Constitution of cellulose.** KURT HESS. *Helvetica Chim. Acta* 3, 866-9(1920).  
—Polemical against Karrer (*C. A.* 15, 61). C. J. WEST

**Cellulose acetates.** J. O. ZDANOWICH. *J. Ind. Eng. Chem.* 12, 1173-4(1920).  
—Z. has developed a new process for the manuf. of cellulose acetates substituting org. acids, especially chloroacetic acids, in the nascent state, for H<sub>2</sub>SO<sub>4</sub> by adding a halogen to the acetylating mixt. After the mono- and diacetates are formed, the esterification becomes slow, but the addition of 1% or less of H<sub>2</sub>SO<sub>4</sub>, or some other powerful condensing agent, readily completes the reaction. The product can be pptd. with water, is perfectly white and will dissolve very quickly with almost no residue without passing through the gel state. The viscosity of the soln. is very low, which makes possible great economy of solvents. H. H. HARRISON

**Paper-making fibers.** *World's Paper Trade Rev.* 74, 1250(1920).—Panama is surveying its natural resources for paper-making, among which are mentioned hohary wood, balsa, seiba, quipo, banana stalks, etc. C. J. WEST

**The use of bamboo as a paper-making material.** CH. GROUND. *Papier* 23, 298-301 (1920).—A description of various species of bamboos, of the manner in which some of them can be cultivated in the south of France, and of its treatment in the manuf. of

paper pulp. The stems are cut diagonally into disks 2-3 cm. thick, the nodes sepd., the remainder crushed, cooked for 3-4 hrs. under a pressure of 3 kg. with 8-10% NaOH, washed, defibred, and bleached. Bleaching with Cl does not yield as white a fiber as electrolytic bleach or  $\text{KMnO}_4$ . The yield is usually about 45%. The pulp may be used either alone or in combination with rag stock for the manuf. of semi-fine, fine, and de luxe papers. When used alone it can be made into very thin and fairly strong onion peel papers.

A. P.-C.

**The selection and testing of paper fillers.** E. G. MILHAM. *Paper Industry* 2, 1375-77, 1438(1920).—A good filler should have a low moisture content, be a clear bright white in color, be free from dirt, grit and hard lumps, should mix readily with water to form a smooth cream, should not foam when mixed with an excess of alum if it is to be used in rosin-sized papers and should be comparatively insol. in water. For soft, opaque, non-dusting papers clay is the best filler to use.  $\text{CaCO}_3$  fillers such as "whiting," "French chalk," etc., should not be used for rosin-sized papers.

H. H. HARRISON

**Wilkinite, a new loading material.** SIDNEY D. WELLS. *Paper* 27, No. 14, 19-21, 34(1920).—A highly colloidal clay, wilkinite, has been investigated as a loading material for book papers. It was found that used in amts. up to 30% of the total loading material, the remainder being English china clay, a paper with superior finish, appearance and feel was obtained and that the color of white paper was not affected more than could be corrected with small amts. of blue colors. It was also found that the greater the proportion of wilkinite used the greater was the retention of loading. A slowing of the stock on the wire resulting in better formation and distribution of the loading and reduction of the wire mark was observed.

H. H. HARRISON

**Economic utilization of heat and power in paper mills.** *World's Paper Trade Rev.* 74, 1485 ff, 1584 ff, 1798 ff(1920).—A general discussion of the entire subject of heat and power. The need of reliable data is pointed out.

C. J. WEST

**Fifty-ton sulfite paper mill requires 1,500 horsepower in motors.** H. E. STAFFORD. *Elec. World*, 77, 265-8(1921).—A detailed description of the process and equipment of the Provincial Paper Mills, Ltd., at Port Arthur, Ontario.

C. G. F.

**The utilization of sulfite waste liquor.** J. G. VARLOT. *Papier* 23, 281-4(1920).—A brief review of various uses for sulfite waste liquor; binder for roads and briquetted fuels, tanning exts., fuel, and EtOH.

A. P.-C.

Softening celluloid, etc. (Brit. pat. 151,744) 18. Dye base from peat (U. S. pat. 1,362,879) 25. Solutions for tanning from sulfite waste liquor (Ger. pat. 321,331) 29.

**Cellulose acetate solutions.** H. DREYFUS. U. S. 1,363,763, Dec. 28. Solns. of cellulose acetate suitable for coating fabrics of aircraft are prepd. by use of acetyl-acetone as a solvent together with other solvents and plasticizing agents such as ethylideneacetone, MeOAc, triphenyl phosphate, alc.- $\text{C}_6\text{H}_6$  mixt., or methyl *o*-phthalate.

**Incombustible celluloid-like pyroxylin composition.** S. H. WOOD. U. S. 1,364,342, Jan. 4. An incombustible material suitable for the manuf. of motion picture films is formed of pyroxylin 10,  $\text{C}_{10}\text{H}_8$  1,  $\text{FeCl}_3$  3, and gelatin 5 parts.

**Apparatus for converting cellulose into glucose.** R. A. KOCHER. U. S. 1,362,875, Dec. 21.

**Finishing paper.** C. W. COOK. U. S. 1,362,677, Dec. 21. A sheet of embossed pyroxylin is used as an embossing die for finishing paper with an embossed surface.

**Fabric finish on paper.** C. W. COOK. U. S. 1,362,678, Dec. 21. A fabric design in a metal plate is pressed against a pyroxylin surface while in moldable condition, the pyroxylin is permitted to harden and is then used as an embossing die for producing a finish on paper similar to the fabric used.

Pulp and other products from western larch. H. F. WEISS. U. S. 1,384,418 Jan. 4. Comminuted wood of the western larch is digested with sulfite liquor to produce a pulp and a waste liquor containing the sol. products of the larch and the waste liquor is treated for the recovery of galactan or mucic and oxalic acids or subjected to alc. fermentation.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

The technical production of picric acid directly from benzene. FR. BLECHTA. *Chem. Listy* 14, 161-5(1920).—B. attempted to det. the most favorable conditions for the manuf. of picric acid directly from benzene. This work was based on the investigations of Wolfenstein and Bötters, who conducted the oxidation of the benzene and the nitration of the intermediately formed phenol in one operation by treating the benzene with hot  $\text{HNO}_3$  (d. 1.31), in the presence of Hg as a catalyzer. This method of nitration gave rise to a large amt. of gas and nitrous vapors which entrained large quantities of unattacked benzene. To avoid this, B. constructed a lab. app. in which the gases and vapors were prevented from escaping through the entrance provided for the agitator, but were forced to pass into a reflux condenser. The time necessary for complete nitration was found to be 6 hrs. The largest yield of picric acid was obtained when  $1\frac{1}{4}\%$  of Hg, based on the total wt. of the reacting liquids, was used as a catalyzer. With higher amts. of Hg the yield increased negligibly. The most important factors were the temp. at which the reaction took place and the concn. of the acid used. Curves were detd. to show the relationship between these 2 factors. 100 g. batches of benzene were taken and temps. of 50, 70 and 90° investigated. The results showed that, using 50° as the reacting temp., to obtain the max. yield of 80 g. of picric acid, 65% of  $\text{HNO}_3$  had to be used. For reacting temps. of 70 and 90°, the concns. of  $\text{HNO}_3$  necessary to obtain the max. yield were, resp., 60 and 50%. In the latter cases the max. yield was slightly lower than that obtained at 50°. The best proportion of  $\text{HNO}_3$  with reference to the amt. of benzene used was found to be 10:1. B. expressed the opinion, based on his results that this method of producing picric acid would not meet with any peculiar technical difficulties. Its com. success will depend more on the economical utilization of the large amts. of nitrobenzene formed as a by-product. JOHN M. KRNO

Decomposition of nitro products. S. BROWN. *Chem. Trade J.* 67, 673(1920).—Because of an explosion in a nitration plant in which the action of lubricating oil on the nitration mixt. came under suspicion tests were made in which crude dinitrotoluene and also crude dinitrobenzene were subjected to heating with concd.  $\text{H}_2\text{SO}_4$ , oleum or with  $\text{DNF}$  nitrating acid both alone and with the addition of the lubricating oil and it was found that the oil accelerated the rate of decompn. of the nitro product.

CHARLES E. MUNROE

The velocity of decomposition of high explosives in a vacuum. I. ROBERT CROSBIE FARMER. *J. Chem. Soc.* 117, 1432-45(1920).—Previous investigations of the stability of explosives through observations on their decompn. in a vacuum have been devoted almost entirely to the nitric esters. F. having devised a modification of the app. used, which is pictured and described in this paper, turned his attention to the nitro-aromatic compds., finding that, as in the case of the nitric esters, the decompn. is partly catalytic and partly noncatalytic. When catalytic influences are eliminated, the velocity sinks to a minimum. In many instances the catalytic decompn. outweighs the intrinsic decompn. of the pure substance. It is frequently difficult so to purify the explosive that the catalytic influences are completely removed, and hence different preps. of the same substance often differ considerably in their rates of decompn. Frequently the evolution of gas proceeds with an acceleration due to auto-



catalysis, while in other cases it becomes slower after a time owing to the decompn. and elimination of impurities. In many cases the presence of moisture gives rise to very erratic results, and special steps are, therefore, taken to eliminate this influence. As a rule, in these expts., the decompn. was carried only to the extent of a small evolution of gas. The measurement of small vols. of gas has the disadvantage that the measurements are more affected by traces of substances, such as volatile matters, but if the decompn. is carried further the products are liable to have a very disturbing effect and frequently a very rapid evolution of gas sets in. An approx. idea of relative stability may be reached by calcg., by extrapolation, the temp. at which the gas evolution amounts to 1 cc. per g. in 100 hrs., giving the following order:

Trinitrobenzene.....	190-195°
Trinitrophenol.....	150-155°
2,4,6-Trinitrotoluene.....	135-140°
2,3,4-Trinitrotoluene.....	135-140°
3,4,6-Trinitrotoluene.....	130-135°
Trinitrophenylmethylnitroamine.....	115-120°
Cellulose nitrate (N = 13%).....	Approx. 100°

The stability shown by trinitrobenzene is, considering the difficulty in introducing the third  $\text{NO}_2$  group, of special interest. It was surprising to find that mixts. of picric acid and TNT showed a lower rate of decompn. than TNT alone, owing, possibly, to the TNT existing as an equil. in which a small quantity of an unstable iso-nitroso compd. is present which may be caused to revert to the normal nitro compd. by the picric acid. An unsatd. compd., such as castor oil, mixed with TNT or with picric acid, was found to depress the stability in each case. **II. Trinitrophenylnitramine (tetryl).** *Ibid* 1603-14.—The vacuum stability test was devised mainly for the control of the manuf. of tetryl and has been so used as a standard method for a number of years. The m. p. of tetryl being 129.1°, the temp. 120° has been found best for measurement as the tetryl is solid and gives, in about 2 days, convenient vols. of gas, consisting of  $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{N}_2$  and  $\text{O}_2$ , leaving, as a residue, a complex mixt. of picric acid and other substances. 5 g. of well purified tetryl yield 1.5-3 cc. of gas. The reaction is very sensitive to catalytic influences. One of the main causes of instability is the presence of analogs of tetryl containing an  $\text{NO}_2$ -group in the *m*-position. Traces of picric acid also seriously affect the stability. The temp. coefficient of the decompn. of solid tetryl is 1.9 for 5°. Extrapolated to ordinary temp. 40 hrs. at 120° corresponds to about 1700 years at 20°. The great increase in the velocity of melting is the main cause of acceleration in the decompn. at 120°. This rapid decompn. of molten tetryl makes it impossible to obtain accurate measurements of the f. p. ("setting point") but the m. p. can be detd. without appreciable error by the capillary method. Many data are given on methods of purification of tetryl and in crystn. methods it was found that the stability was affected by the size of the crystals, large ones decomp. more rapidly than small probably owing to the retention of volatile decompn. products within them. (Cf. *C. A.* 14, 2708.)

CHARLES E. MUNROE

The propagation of flame in mixtures of methane and air. **II. Vertical propagation.** **III. Propagation in currents of the mixtures.** WALTER MASON AND RICHARD VERNON WHEELER. *J. Chem. Soc.* 117, 1227-40(1920); cf. *C. A.* 13, 2447; 14, 1221. —The object of the expts. in Part II was to obtain information as to the magnitude of the effects of convection currents on the speed of the flame, since, except perhaps during the "uniform movement," the transference of heat by them clearly plays an important part in the transmission of flame, and is accountable for many of its phenomena. The well known fact that the limits of inflammability of gaseous mixts. vary with the position of the point of ignition according as the flame has to pass upwards or downwards through the mixt., more combustible gas being required to form a lower-limit mixt.

under the latter conditions, is explicable on the assumption that during the downward propagation of flame convection currents do not materially affect the transference of heat to unburnt layers of the mixt. A like explanation can be given for the fact that when air mixts. containing less than 7.5 and more than 12.5% of  $\text{CH}_4$  are ignited at the center of a closed spherical vessel, flame reaches the bottom of the vessel later than it reaches the top by an interval of time which varies with the  $\text{CH}_4$  content. Flame should travel vertically in a given mixt. more rapidly when it is ignited from below than from above if only by virtue of the currents produced by the heated gases. Under special conditions of ignition at the center of a closed vessel any difference there may be between the speeds of upward and downward propagation of flame is inappreciable with mixts. containing 7.5–12.5% of  $\text{CH}_4$ . As a result of this investigation the initial slow movement of flame at a uniform speed, styled the "uniform movement," should be regarded simply as a particular phase in the propagation of flame that occurs when ignition is effected in a quiescent mixt. at the open end of a straight, horizontal tube closed at one end, and not as resulting from a particular mode of heat transference. The idea that this "normal" propagation of flame is solely by conduction of heat from layer to layer of the mixt. is untenable. Further, it is shown that there is a uniform régime in the propagation of flame from the open to the closed end of a straight tube when the tube is vertical and the direction of travel either up or down. In investigations of *ignition at the open end of a vertical tube closed at the other end* it was found that a uniform speed over a considerable distance might obtain with all the mixts. employed, the vibratory movement beginning somewhat earlier than in a horizontal tube of the same diam. Irregularities of results were found due to resonance being prematurely induced at, or very shortly after, the moment of ignition by some action on the part of the experimenter. Photographs given show that when the tube was resonating the undulations of the flame front were unsymmetrical, while when the tube was not resonating the flame front was quite symmetrical. It was established that a phase in the propagation of the flame during which the speed is uniform is obtained when the flame travels from the open to the closed end of a tube whether the direction of travel is horizontal, vertically upwards or vertically downwards and that *this uniform speed for any given mixt. is slowest during downward propagation*. Insofar as the term "uniform movement" of flame has been held to be the normal propagation of flame by conduction of heat it ought to be discarded but this term is a useful one and fittingly describes a phase in the propagation of flame, obtainable under a variety of conditions, which should be specified, the identification and measurement of which is of considerable value. As a name, without implying a mode of heat transference, it may be conveniently retained. In *ignition at one end of a vertical tube open at both ends* the tube becomes a "chimney" and there is added to the speed of a flame traveling up the tube the speed of the draft produced by the chimney, the mechanical effects of which in promoting turbulence of the mixt. probably augments the speed of the flame. Flame does not pass downwards if the mixt. is ignited at the top of the tube but continues to burn at the mouth until the whole mixt. has been drawn up. The speeds of the flames at all stages of their propagation are considerably faster during upward than during horizontal propagation. A characteristic novel to these investigations is that the maximum speed of flame in  $\text{CH}_4$ -air mixts. is with those containing about 12 percent of  $\text{CH}_4$  instead of the usual 9.5–10.5%. In *ignition at the closed end of a vertical tube open at the other end* the position of the tube does not affect the results. In part III by connecting the holder containing the  $\text{CH}_4$ -air mixts. to a horizontal tube so as to get any desired rate of current flow it was shown that the major effect of this current is turbulence. An increase of speed of current from *nil* to 23 cm. per sec. nearly doubled the speed of the flame, thus emphasizing the important part convection currents play in the transmission of flame. Repeated experiments with a mixt. containing 5.02–5.08% of  $\text{CH}_4$  showed that while at rest flame

does not travel in it but when moving as a current along a tube flame travels in it at the speed of the current. These experiments point to a sharp distinction between a 5.00%  $\text{CH}_4$  mixt. incapable of maintaining a flame apart from the source of heat which originated it, and one of 5.02% of  $\text{CH}_4$  in which flame is maintained after the igniting source has been withdrawn. The flame in this mixt. would travel along the roof of a roadway in a mine (cf. C. A. 13, 2447; 14, 1221).

CHARLES E. MUNROE

**Causes and prevention of fires and explosions in bituminous coal mines.** EDWARD STRIDLE. *Bur. Mines, Miners' Circular* 27, 75 pp. (1920).—This consists of 117 photographs taken underground which portray "good" and "bad" practice in the various operations of mining bituminous coal. Copies of these views for use as lantern slides in illustrating lectures may be obtained at cost from the Pittsburgh expt. station of the Bureau of Mines.

CHARLES E. MUNROE

**Transportation of explosives and other dangerous articles.** B. W. DUNN. *B. E. Accident Bull.* No. 30, 8 pp. (Jan. 3, 1921); cf. C. A. 14, 1756.—D. treats of securely blocking other freight loaded near explosives by photographs showing freight cars in which heavy rolls of wire and empty gas cylinders are stowed, insecurely blocked, with boxes of dynamite. The rolls of wire shifted and several fell in the direction of the explosive, the cover of one case being so split as to expose the dynamite cartridges. In loading *molasses feed*, or other stock feeds having liquid sweetening ingredients, in tank cars a 2-foot space should be left unfilled to reduce the likelihood of spontaneous heating. Forty-two cases of *spontaneous fires* and heating from shipments of *alfalfa molasses feed* and 6 from mixed feed were reported during the previous 3 months. Spontaneous decompn. of *bleaching powder* caused 2 heavy losses while 5 persons were overcome by the fumes from it. The largest space is given to *comments on carboys* dealing with cushioning, closing device, repairs, inspection on shipment, proper loading and bracing, proper handling of cars in transportation, and tests of boxed carboys.

C. E. M.

#### Railway carriage of dangerous goods (ANON.) 13.

**Explosives.** E. MULLER. *Brit.* 152,199, Oct. 2, 1919. This patent relates to explosives prep'd. by mixing  $\text{NH}_4\text{NO}_3$  and hydrocarbons or hydrocarbon derivs. when both constituents are in the molten condition, and consists in making the mixt. under slight pressure, i. e., from 0.5–1.0 atms. The melting together is performed in an autoclave or digester the safety valve of which regulates the pressure. One example contains 94% of  $\text{NH}_4\text{NO}_3$  and 6% of petroleum. Wood meal and alkali chlorides may be added.

**Blasting detonators.** SPRENGLUFT-GES. *Brit.* 152,335, July 10, 1920. This patent relates to detonators adapted to be impregnated with liquefied gases for detonating blasting cartridges similarly impregnated, and consists in inclosing the detonator charge in a perforated casing of metal or like rigid material instead of in a casing of cardboard as heretofore. The detonator charge may be made up of paraffin and cork flour, with which can be mixed  $\text{PbN}_2$ .

**Pyrotechnic compositions.** A. BROCK. *Brit.* 152,529, Nov. 3, 1919. This patent consists in the use of  $(\text{CH}_2)_6\text{N}_4$  or its salts in substitution of or in addition to the whole or part of the usual combustibles in pyrotechnic compns., such as charcoal, shellac, dextrin, sugar, and oil. Compns. containing hexamethylenetetramine are especially suitable for indoor fireworks, where it is desirable to reduce noise and smoke.

**Nitro compounds for use in explosives.** C. M. STINE. *Can.* 207,213, Jan. 4, 1921. The prepn. of aromatic compds. containing both nitro and nitrate groups for use in explosives is described. Cf. C. A. 13, 2598.

**"Damp-proof" matches.** R. DUBRISAY. U. S. 1,368,095, Dec. 21. Match-head compns. are rendered resistant to moisture by the use therein of resorcinol and  $\text{CH}_2\text{O}$  soln. and a condensation catalyzer, e. g.,  $\text{Na}_2\text{CO}_3$ . Cf. C. A. 14, 3583.

## 25—DYES AND TEXTILE CHEMISTRY

LOUIS A. OLNEY

**Dyestuff industry.** HERBERT LEVINSTEIN. *J. Soc. Chem. Ind.* 39, 317-22T (1920).—In this address L. gave strong arguments for the speedy passage of the Dye Bill then before Parliament [the bill has since passed]. Many of the points made apply with equal or greater force to the bill before the present U. S. Senate. Discussion.

L. W. RIGGS

**The British dye bill.** ANON. *J. Ind. Eng. Chem.* 13, 169(1921).—A bill to regulate the importation of dyestuffs.

E. J. C.

**Chemical science in the dyeing industry.** MOULTON. *J. Soc. Dyers and Colourists* 36, 273-9(1920).—Presidential address.

L. W. RIGGS

**Organization and construction of dyehouses.** A. W. BENOIT. *Textile World J.* 58, 4287-91(1920).—Location, ventilation and piping are considered from the engineering view-point.

CHAS. E. MULLIN

**Standardization of dyestuff intermediates.** ERNEST FYLEMAN. *Chem. Age (London)* 3, 628-9(1920).—The advantages of standardization are stated as follows: (1) Identity in effective strength, compn. and physical properties of standardized products from all sources. (2) Economy of manuf. of intermediates, resulting from definite knowledge in advance of quality required, and reasonable security against competition by products of less value. (3) Advantages in marketing the products abroad by securing a definite recognized standard for British products. (4) The pooling of knowledge and experience between consumer and producer, which would result from a standardizing committee. (5) The business advantage of definite specific compn. and properties of com. products when placing or accepting orders. F. suggested that the Soc. Dyers and Colourists form a standardization committee of some 15 members to work on the lines indicated.

L. W. RIGGS

**Laboratory methods of dyeing and testing cotton dyestuffs.** P. F. ESTEV. *Am. Dyestuff Rep.* 8, Sec. 2, 16-20(1921).—An analytical balance for weighing dyes and a coarser balance for weighing chemicals should be provided. The dye bath is a rectangular tank of hammered Cu, provided with a closed steam coil for heating. The top plate of the tank has 6, 8 or 12 holes large enough to admit 550 cc. porcelain beakers glazed throughout, but small enough to prevent them slipping through. The beakers should be consistent in size and taper so that any beaker will fit any hole in the top plate. The bath should be filled with water to within 3 inches of the top, and when the water is boiling it will maintain the dye liquor in the beakers at 91 to 96° throughout the process. The cotton should be taken from samples well kiered in the works and otherwise treated as are bulk goods. Bleached cotton should be used for sky blues and other light tints. Much time is saved by having stock solns. of 10% HCl, AcOH and NaOH, 6% Na<sub>2</sub>CO<sub>3</sub> and NaNO<sub>3</sub>, 4% NaCl and Na<sub>2</sub>SO<sub>4</sub>, and 2.5% Na<sub>2</sub>S. A 2% dyeing based on the wt. of the yarn is used. This on a 20 g. skein would require 0.4 g. of dye, and the bath is made up to 400 cc., which is about factory proportions. 10% Na<sub>2</sub>SO<sub>4</sub> is used to force the color into the cotton; this would be 50 cc. of the stock soln. If 6 tests are to be made, 6 beakers are placed in a row, made up to 350 cc. with the Na<sub>2</sub>SO<sub>4</sub> and water and covered with watch glasses. A list is prep'd. showing the percentages used, names of the dyestuffs, names of the manufacturers, and the order of the beakers in the bath. Beakers are kept in the order of the list, the work being done from left to right. Next 0.4 g. of dye is weighed and placed in the beaker at the extreme left, and the weighings continued until the list is completed when the beakers are placed in the bath. While the dyes are being weighed, 20 g. skeins are being boiled out in a pan of water with a little soap or sol. oil. They are then well washed and wrung between stout glass rods. Stirring rods are placed in each beaker and the baths stirred until

the dye is dissolved. Any difficulty in soln. of the dye or insol. matter present is noted at this point. The skeins are now introduced on rods, into the dye, turned, and the time of starting recorded. Dyeing is continued 1 hr. care being taken to turn the skeins every few min. At the end the skeins are removed in order, washed in clean cold water, wrung evenly with glass rods, labeled and hung in the drier. Many variations, with details, from the above procedure are given to suit particular dyes. Money value tests are made as follows: if 2 dyes cost 85 and 90 c., resp., make a 2% dye of the first and an 85/90 of 2% of the 2nd; the heavier shade is the cheaper dye to use. To learn if a dye is a mixt., label white blotting paper with the name of the dye, vender, and date; place the paper on a large square of glass and moisten evenly. Take out about 0.1 g. of dye on the point of a knife blade and blow the dye evenly over the paper. The paper may be dried and kept for reference. Details are given for exhaust tests, fastness to light, washing, warehouse storing, scrubbing, ironing, calendering, acids, alkalies, chemic, and rubbing.

L. W. RIGGS

**Differentiation of yellowwood extract (morin) from that of quercitron (quercitrin).** E. JUSTIN-MUELLER. *Bull. soc. chim.* 27, 844-6(1920).—The ext. of yellowwood, called Cuban ext. or old fustic, of which the active principle is morin, is not readily characterized by the general reactions for that of quercitron. The only really practical and conclusive differentiation consisted in making comparative color tests on strips of cotton mordanted with iron or alumina. A sp. test described by the author consists in dissolving a trace of the ext. (dry or concd. liquid) in  $H_2SO_4$  of 66°, then dilg. same with cold  $H_2O$ . On dilg. thus, yellowwood ext. retains its bright orange-yellow tint, while the color due to quercitron disappears completely. In addition to photomicrographs of the 2 exts., the paper also contains a table showing the behavior of the 2 products when treated in accordance with the new reaction, and with other commonly applied tests.

W. O. E.

**Treatment with diazotized paranitroaniline.** RAFFAELE SANSONE. *Textile World J.* 58, 1315(1920).—The paper deals with the substitution of *p*-nitroaniline for  $NaNO_2$  and  $\beta$ -naphthol, resorcinol, *m*-toluylenediamine, etc., in dyeing cotton goods and yarns. Stock soln. formulas are given.

CHAS. E. MULLIN

**Dyeing of artificial silk.** LEONARD P. WILSON AND MARJORIE IMISON. *J. Soc. Chem. Ind.* 39, 322-4T(1920); cf. Peters, C. A. 15, 600.—Recent study has shown that all direct colors suitable for cotton cannot be used on artificial silk, as an unevenness may occur with the latter which is concealed in cotton by the mixing of a very large number of fibers to form a thread. "Evenness at normal dyeing temp., 50°, varies according to the mol. wt. of the dyestuff used; the arrangement of the groups in the mol. and their nature have, apparently, no real effect." Dyestuffs of low mol. wt. give very even results under normal dyeing conditions although the silks may vary considerably. The same silks with dyes of high mol. wt. give uneven results. Rosophenine 10 B, mol. wt. 600, is even-dyeing. Dianol sky blue, mol. wt. 992, is very uneven. Lists of direct cotton colors and sulfur colors which are even, moderately even or uneven are given. Basic dyes as a class dye evenly and may be used where great fastness is not essential. These dyes are of low mol. wt.

L. W. RIGGS

**Methods of direct indigo printing.** RAFFAELE SANSONE. *Textile World J.* 58, 4293-5(1920).—A discussion of modifications in compn. and the application of color pastes, with formulas.

CHAS. E. MULLIN

**Fast colors and fugitive colors.** JULES MONNET. *Textile World J.* 57, 4685-7(1920).—How the dyer must regard dyestuffs as to fastness.

CHAS. E. MULLIN

**Processes for dyeing of hosiery.** ANON. *Textile World J.* 58, 1685-7(1920).—For aniline black: Boil out hosiery 1-1.5 hrs. in 300 gals.  $H_2O$  with 5-6 lbs.  $Na_2CO_3$ , rinse in 2 waters and sour in 1.5 gals. AcOH to each 100 lbs. hosiery at 115° F. Aniline bath is prepd. a day before use in crockery. (A) 80 lbs. aniline oil dissolved slowly in

80 lbs. 28° Tw. HCl, temp. not higher than 80° F. (B) 80 lbs. aniline salt dissolved in 40 gals. H<sub>2</sub>O. (C) 80 lbs. NaClO<sub>2</sub> dissolved in 32 gals. H<sub>2</sub>O. Mix A, B and C well together. For use dil. this mixt. to 12° Tw. and add 1 gal. D. (D) 12.75 lbs. CuSO<sub>4</sub>, 10.5 lbs. Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and 1.5 lbs. H<sub>2</sub>SO<sub>4</sub>, dil. to 6° Tw. After machine dyeing and boarding, bake for 2 hrs. at 135° F. and wash in H<sub>2</sub>O containing 3 lbs. Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, heating to 80–100° F. Wash well, soap, soften and dry. Diazotized and developed colors after boiling out are dyed as usual with proper dye and NaCl, boiling 1 hr. Immerse hose 20 min. in diazotizing bath, for light or medium shades 1.5–2 lbs. NaNO<sub>2</sub> and 5 lbs. HCl in cold H<sub>2</sub>O. Heavy shades and blacks, 2.5–3 lbs. NaNO<sub>2</sub> and 7.5 lbs. HCl. Rinse in cold H<sub>2</sub>O. Diazotized goods should not be exposed to air or sunlight. Develop cold, light shades 0.5–0.75 lb. developer and 0.25 lb. NaOH or Na<sub>2</sub>CO<sub>3</sub>. Heavy shades, 1–1.5 lb. developer and 0.5 lb. NaOH or Na<sub>2</sub>CO<sub>3</sub>. Dyeing, diazotizing, rinsing and developing may all be done in the same machine without removal of hosiery. Direct dyes should receive an after-treatment with HCHO, CuSO<sub>4</sub>, Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> or a mixt. of latter 2, to increase fastness. Sulfur dyes should be handled in iron or wood with no brass, bronze or Cu.

CHAS. E. MULLIN

Conditions for dyeing clothing in fast colors. ERICH STEINBERG. *Deut. Färber-Zig.* 56, 917–8, 934, 952(1920).—The scarcity of textile materials in Germany has raised the problem of redyeing the war fabrics. The selection of dyes and methods of attaining the requisite degrees of fastness to light, washing, acids, alkalis, etc., are discussed in detail for the different materials employed and the uses of the finished product.

L. W. RIGGS

Shoddy dyeing. ALBERT WINTER. *Deut. Färber-Zig.* 56, 933–4(1920).—The sorting, washing, carbonizing and dyeing of shoddy material is described in detail.

L. W. RIGGS

Catalysts in bleaching and dyeing. ANON. *Posselt's Text. J.; Am. Dyestuff Rep.* 8, Sec. I, 12–5(1921).—In general catalysts are used to modify chem. reactions which in the absence of the catalyst would result in more or less tendering of the fiber. For example, hydrosulfite preps. have displaced tin salts in discharging para red and other ice colors. In prepg. cloth for dyeing diastase (diastase) is used in place of acids or alkalis. Sulfur blacks may oxidize in storage, producing H<sub>2</sub>SO<sub>4</sub>. This may be avoided by having no substance present such as metallic salts which act as catalysts between S in the dye and O of the air. The transformation of aniline to aniline black is essentially one of oxidation in an acid medium; in this various salts are used to accelerate the transference of O from the oxidizer to the aniline. Cu, V, and prussiate aniline blacks are named from the catalyzer used. Metals must be kept out of H<sub>2</sub>O<sub>2</sub> solns. because of their catalytic actions. Ca(OH)<sub>2</sub> aids catalytically the aerial oxidation of cellulose. Catalysts must always be under control.

L. W. RIGGS

Tartar emetic in the dye house. ELTON R. DARLING. *Textile World J.* 58, 3641–3(1920).—While tartar emetic contains about 42.5% Sb expressed as Sb<sub>2</sub>O<sub>3</sub>, only about 37% is obtainable in practice and the av. plant utilizes but 29% of available Sb. It does not keep well moist or in soln. A standing bath is generally used containing 1–2 lbs. emetic for each 10 gals. soln., at 30–60°C. Sb control of bath is as follows: To 5 cc. soln. add 150 cc. H<sub>2</sub>O and Na<sub>2</sub>CO<sub>3</sub> to slight cloudiness, then 10 cc. satd. NaHCO<sub>3</sub> and starch indicator. Titrate with 0.1 N I. Each cc. = 0.00721 g. Sb<sub>2</sub>O<sub>3</sub>, or 0.01662 g. emetic. Test the bath at the start and after each lot of goods has been through. The tank must be free of metals, even nail heads, to avoid dull colors. When the goods enter tank "antimony oxide" leaves emetic to combine with tannin and 1.4 parts K-H tartrate remains in soln. for each part Sb oxide removed. Sb tartrate formed is sol. in this K-H tartrate and, therefore, the acid tartrate should be removed by adding Na<sub>2</sub>CO<sub>3</sub> or preferably CaCO<sub>3</sub>. Neutralization is controlled by reference to analyses for Sb control of bath. For each part Sb oxide removed from soln.,

1.4 parts K-H tartrate is formed. To neutralize each 3.6 parts K-H tartrate is required 1 part  $\text{Na}_2\text{CO}_3$  or 0.9 part  $\text{CaCO}_3$ .

CHAS. E. MULLIN

**Scouring process.** JOHN SCHOFIELD. *J. Text. Inst.* **11**, 317-8(1920).—Among many details mentioned are the following: Filtered water should be used for finishing purposes, sand filtration being cheap and efficient. Hard water should be softened. In the finishing process, low-pressure steam was preferred to high. The extra heat from high-pressure steam was negligible in comparison with the latent heat of steam at  $100^\circ$ . Oil soaps made from oleins or oleic acid are preferred to the harder soaps. Oils are removed only by working them into emulsions, which must be done by soaps. After lathering the piece freely for 5 to 15 min. the suds should be run off and the machine run practically dry, when another batch of alkali is added. The first treatment removed the grease from the surface of the fiber and the second the oil which had penetrated the fiber. About 30% mineral oil should be carried away in scouring. Expts. by Shaw and Begg on the cost of scouring out various oils per 100 lbs. of wool gave 7/1 s. for pre-war black oil, 68% free fatty acid; 10/1 s. distd. olein, 65% free fatty acid; and 10/7 s. Australian olein, 98% free fatty acid. Other oils tested were much more costly. Ammonium soaps were more expensive than Na soaps. Al should be used in textile machinery to avoid stains. Rollers could be made much smaller and pressure secured by springs or wts.

L. W. RIGGS

**Recovery of grease from effluents.** J. H. GARNER. *J. Text. Inst.* **11**, 351-2 (1920).—The chief sources of recovery are wool washing, piece scouring, shoddy, greasy cleaning waste and sewage. Recovery of K from wool is not economical under the present methods of wool washing, but with the solvent process in which grease is first removed, the K may be extd. with water and recovered by evapn. To make a profit this must be done on a large scale. Of various methods tried none have succeeded in displacing the old acid process. "This consisted in cracking the suds in tanks, allowing the fat to sep. at the top and bottom of the liquid, running off the clear liquid and making the fatty matter into puddings with pieces of sacking and hot pressing." It is possible to recover 95% of the grease in this way, but by carelessness 20 to 40% of the grease was often lost. The suds should be *cold* before the acid is added or some of the grease will be emulsified. The amt. of  $\text{H}_2\text{SO}_4$  added in excess of that required to neutralize the liquid should be 50 to 100 parts in 100,000, varying with the class of liquids treated. After the acid is added the contents of the tank must be thoroughly mixed with a mechanical stirrer or an air blast. Enough tanks should be provided that the liquid in a tank may stand 24 hrs. after mixing. Grease in sud cake, shoddy and cotton wastes is usually recovered by solvent extn. with petroleum benzine. An instance is given of a grease recovery plant that paid 50% annually on the cost of installation, and during 3 years of the war paid 100%.

L. W. RIGGS

**Waterproofing of textile fabrics.** ANON. *Textile World J.* **57**, 4687-9(1920).—Materials and processes used in waterproofing, mildew-proofing, bonded fabrics and imitation leathers.

CHAS. E. MULLIN

**Toron finish on cotton goods.** H. S. MILLER. *Textile World J.* **58**, 3639-41(1920).—Uses and possibilities of "toron" are discussed, particularly in rubber goods and as a cotton preservative against rot, mildew, acids and alkalies. Toron is the S-terpene product formed by prolonged heating of turpentine and S. This product is dissolved in a suitable solvent and cotton yarn or fabric is treated with the soln. It permeates and coats the fibers uniformly throughout, giving gray to yellow color, soft silky touch, increased strength and flexing. This flexing is especially desired in tire fabrics.

CHAS. E. MULLIN

**An experiment with milkweed.** GILBERT R. MERRILL. *Textile World J.* **57**, 2155-7 (1920).—Deficiencies of fiber brought out in knitted cloth are described. The cloth has good luster but lacks strength because of smoothness and many short fibers. C. E. M.

Weight corrections for varying humidity. HOWARD T. MAILEY. *Textile World J.* 57, 4246(1920).—The moisture (condition) content of a wool sample during 1919 varied between 10 and 18%.

CHAS. E. MULLIN

Pelt dyeing (BERTHOLD) 29. Points on buying caustic soda (GOLDTHWAIT) 18. Growth of cotton fiber (DOUVE) 11D. Solvents (ethyl chloride for dye manufacture) (BRIT. PAT. 152,550) 18. Hydrating anhydrous substances (dyes) (BRIT. PAT. 149,623) 13.

Dyes. SOC. CHIMIQUE DES USINES DU RHÔNE (ANCIENNEMENT GILIARD, P. MONNET, ET CARTIER). Brit. 152,634, June 18, 1920. Mono- and di-halogen derivs. of 5,5'-dimethylindigo are prep'd. by halogenating 5,5'-dimethylindigo by the usual methods; the mono- and dibromo derivs. are described.

Intermediate products; dyes. G. T. MORGAN and BRITISH DYESTUFFS CORPORATION. Brit. 152,437, July 17, 1919. 4-Nitro-2-naphthol is obtained by diazotizing 2,4-dinitro-1-naphthylamine with nitrosyl sulfate or  $\text{NaNO}_2$  in conc'd.  $\text{H}_2\text{SO}_4$ , pouring the diazo soln. into  $\text{H}_2\text{O}$  to ppt. 4-nitronaphthalene-1-diazo 2-oxide, and heating this diazo oxide with  $\text{EtOH}$ , alone or in the presence of a metallic catalyst such as Zn, Cu, Al or a Zn-Cu couple, or a reducing agent such as  $\text{H}_3\text{PO}_4$ . 2,4-Dinitro-1-naphthylamine is prep'd. either by heating 2,4-dinitro-1-naphthol with alc.  $\text{NH}_3$  at  $200^\circ$ , or by dinitrating an acyl- $\alpha$ -naphthylamine or arylsulfonyl- $\alpha$ -naphthylamine, *e. g.*, aceto- $\alpha$ -naphthalide and hydrolyzing the product, *e. g.*, by heating with  $\text{H}_2\text{SO}_4$ . Azo dyes are obtained in substance or on the fiber by coupling diazo or tetrazo compds. with 4-nitro-2-naphthol; the following products are specified: a dark red wool dye from diazotized sulfanilic acid; and orange dye from diazotized *p*-nitraniline-*o*-sulfonic acid; a purple cotton dye from tetrazotized 4,4'-diaminostilbene-2,2'-disulfonic acid; a purple cotton dye from diazotized safranin; and azo dyes on the fiber from *p*-nitroaniline (bluish red), 2,4-dinitroaniline (red), dianisidine (dark blue), and primuline (reddish brown).

Dyes. BRITISH DYESTUFFS CORPORATION and J. TURNER. Brit. 151,868, Dec. 17, 1919. The products obtained by treating the Na or  $\text{NH}_4$  salts of nitrated diphenylamine compds. with an alk. cyanide in aq. soln., dye wool brown to purple shades. The diphenylamine compds. should yield water-sol. alk. salts; the examples provided being hexanitrodiphenylamine, tetranitromercaptodiphenylamine, 2,4-dinitrodiphenylamine-*p*-sulfonic acid and 2,4-dinitrodiphenylamine-*m*-sulfonic acid.

Disazo dye. T. H. LEAMING and T. M. SUSEMIHL. U. S. 1,363,886, Dec. 28. A dye is obtained by the diazotization of aceto-*p*-phenylenediamine or of *p*-nitroaniline, coupling the diazo comp'd. thus obtained with 1 mol. proportion of 1,8-aminonaphthol-4-sulfonic acid ("S-acid"), coupling the resulting intermediate with another mol. proportion of diazotized aceto-*p*-phenylenediamine or diazotized *p*-nitroaniline and then splitting off the acetyl groups or reducing the nitro groups. The Na salt of the resulting dye is a brown powder sol. in  $\text{H}_2\text{O}$ . The dye dyes vegetable, animal and artificial fibers greenish black shades which can be diazotized and developed on the fiber with  $\beta$ -naphthol or *m*-phenylenediamine or *m*-tolenylenediamine or resorcinol.

Azo dyes. H. FRITZSCHE. U. S. 1,362,936, Dec. 21. Azo dyes are prep'd. from the tetrazo deriv. of 3,3'-diamino-4,4'-dimethyldiphenylmethane and derivs. of 2-amino-5-hydroxynaphthalene-7-sulfonic acid containing an N-methyl- $\omega$ -sulfo radical or from similar compds. The dyes thus formed are red-brown to black-brown powders dyeing cotton red to claret tints of good fastness when diazotized on the fiber and developed. Numerous examples are given.

Dye base from peat. A. M. HART. U. S. 1,362,879, Dec. 21. Peat is treated with  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  in order to obtain a product forming a cryst. comp'd. from the



soln. after neutralization with  $\text{Na}_2\text{CO}_3$  or  $\text{K}_2\text{CO}_3$  and which may be subjected to diazotization to produce a dye.

**Dyeing apparatus.** W. DEAN. Brit. 152,285, June 19, 1920. A dye jig roller consists of a metal tube or spindle with a hardened rubber surface, impervious to, and unaffected by, chemicals, which is secured to the roughened surface of the tube or spindle by one or more intermediate layer of vulcanite or the like.

**Apparatus for bleaching long strips of cloth.** L. K. BIACH. U. S. 1,363,223, Dec. 28.

**Textile fibers from sedges or similar plant materials.** R. A. MARR. U. S. 1,362,723, Dec. 21. Plant material such as sedges, reeds, yucca or bamboo is digested with a soln. of a Zn salt such as  $\text{ZnSO}_4$  and the treatment is stopped short of the point at which any great amt. of the fiber-cementing material is attacked. It is then picked, dried and carded.

**Artificial threads.** GLANZFÄDEN AKT.-GHS. Brit. 152,349, Nov. 13, 1919. Addition to 135,205 (C. A. 14, 1047). The incompletely hydrated alkali cellulose to be converted into viscose according to the principal patent is prepd. simply by immersing the cellulose for a few hrs. in caustic alkali lye, without any subsequent maturing, that is, the alkali cellulose, immediately after pressing to remove excess lye, is treated with  $\text{CS}_2$ ; by this modification a more woolly and stronger spun material is obtained. The quality of the spun material is further improved by reducing the proportion of  $\text{CS}_2$ , and by increasing the cellulose contents of the spinning soln. The prepn. of the alkali cellulose may be carried out at normal temp.; but during the subsequent stages a somewhat lower temp. should be maintained. The viscose soln. is spun in an unripened condition.

**Artificial threads.** GLANZFÄDEN AKT.-GES. Brit. 152,350, Nov. 13, 1919. Addition to 135,205 (C. A. 14, 1047). In the manuf. of a spun material from a viscose soln. prepd. with an incompletely hydrated alkali cellulose, according to the process of the parent case, the cellulose, after immersion in the caustic alkali lye and before treatment with  $\text{CS}_2$  with or without previous maturing, is pressed so as to contain not more than 2 parts by wt. of lye to 1 part of cellulose; by the use of this restricted quantity of alkali, soln. of the viscose during the treatment with  $\text{CS}_2$  is obviated. The temp. of the alkali cellulose must not be allowed to exceed  $20^\circ$ .

**Artificial threads.** GLANZFÄDEN AKT.-GHS. Brit. 152,351, Nov. 13, 1919. Addition to 135,205 (C. A. 14, 1047). Reducing substances such as sugar are added to prevent oxidation of the viscose in the spinning solns. of the principal patent and which consist of a viscose prepd. from an incompletely hydrated alkali cellulose. The reducing substance may be added to the bath of caustic alkali in which the cellulose is first immersed; or it is sufficient to utilize the reducing substances produced in this bath after repeated use. The treated soln. is spun in an unripened condition.

**Hastening bacterial fermentation in water-retting flax and the like.** M. A. ADAM, W. J. FERNIE and THE FIBER CORPORATION, LTD. Ger. 321,521, May 5, 1915. The process is carried out in two stages, with heating, first to a higher temp. and second to a lower temp. The period of treatment at the higher temp. is short, and the temp. during the second period is not materially higher than the temp. prevailing during the ordinary retting process *in pleno*. The retting is begun with  $\text{H}_2\text{O}$  at about  $37^\circ$ , and continued until a turbidity of the waste  $\text{H}_2\text{O}$  and a rapid evolution of gas are observed. The temp. of the  $\text{H}_2\text{O}$  supply is then reduced to about  $23^\circ$  and the retting is completed at this temp., whereupon the container is emptied and recharged.

**Waterproofing composition.** G. C. BAILEY and F. BOETTNER. U. S. 1,364,475, Jan. 4. A waterproof compn. adapted for use on canvas or other fabrics is formed of a coal-tar "pitch resin" 2.5, paraffin or wax 0.07, coal-tar naphtha 7.5 and high-boiling tar acids 0.025 part.

**Waterproofing composition.** W. J. McINTOSH. U. S. 1,364,567, Jan. 4. A compn. adapted for waterproofing leather or woven fabrics is formed of sea wax 7.5, turpentine 18 and gasoline 6 parts.

**Mercerized yarn.** G. E. SCHERMERHORN. U. S. 1,363,358, Dec. 28. In mercerizing the fiber of yarn during the course of its manuf., the yarn is temporarily twisted, for the mercerizing operation, in a direction the reverse of the intended subsequent yarn twist, in order to facilitate handling with but slight probability of breakage.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The exposure of pigments to light. ANON. *Farben-Zig.* 25, 2229-30, 2283-5, 2333-5, 2437-9; 26, 23-4, 58-9, 120-1, 180-1, 240-1, 298-9, 354-5, 413-4, 587-8, 646-7(1920).—A review of the generally desirable properties of pigments with details of the action of light on all the common ones. The effect of sunlight is due to its ultra-violet component and is greater the finer the pigment, and the more extending pigments are admixed with a colored pigment. It is not usually dependent on the thickness of film, but is often greatly influenced by the character of the vehicle, and by the methods of manuf. and the kind of base used in the case of lakes and some mineral pigments. A small amt. of moisture often increases the permanency of a pigment to light. Fading tests on pigments for special purposes should be conducted by applying them in the same manner in which they are to be used; but relative fastness to light is best detd. by rubbing up the pigment in a H<sub>2</sub>O bath of gum arabic and applying to a heavy white paper of definite quality. Pigments are usually more readily affected by light when in H<sub>2</sub>O pastes than in oil pastes. The yellowing of white paints is discussed. Others generally are very permanent but some show slight paling or greening. The darker PbCrO<sub>4</sub> pigments are more permanent than the lighter shades, but all are influenced by the method of manuf.; ZnCrO<sub>4</sub> is extremely permanent; the lighter shades of CdS have a tendency to brown, and long exposure will change all CdS yellows to a dark straw or leather-brown color. Pb<sub>2</sub>O<sub>4</sub> changes to a muddy brown depending on the nature of the undercoat, the vehicle, and especially the cryst. character of the pigment; it is apparently a chem. change into a Pb suboxide. This change occurs more rapidly on Fe than on wood probably because the former is a better conductor of heat. Pb<sub>2</sub>O<sub>4</sub> paints on hot surfaces often become brighter in color; on cooling in the dark they revert to their original color but on cooling in the light their brighter color remains and finally changes to muddy brown. Natural Fe oxides are very permanent; Fe<sub>2</sub>O<sub>3</sub> manuf. from residues of pyrite burners often darkens on exposure. The darkening of English vermilion is due to a partial cryst. transformation into the brown amorphous HgS. Natural vermilion is more resistant to light than the manuf. variety. Vandyke red, a CuFe(CN)<sub>3</sub> pigment, now used only by artists, is extremely permanent. Ultramarine and Prussian blues by themselves are fast, and all seeming discolorations can usually be traced to the vehicle in which they occur, to the action of admixed pigments, or to impurities, in which case light acts as a fading accelerator. Prussian blue mixed with PbCrO<sub>4</sub> often fades very rapidly, but mixed with ZnCrO<sub>4</sub> is much more permanent. Oil greens (aniline colors), Victoria greens (Cr(OH)<sub>3</sub> + ZnCrO<sub>4</sub>), and Cr<sub>2</sub>O<sub>3</sub> greens are very fast. Verdigris in a varnish vehicle develops from a bluish green to a bright permanent green color. The natural brown and carbon black pigments are permanent.

F. A. WERTZ

**Green earth and white earth.** ANON. *Farben-Zig.* 26, 415(1920).—Some basic green dyes such as brilliant green and malachite green produce lakes more permanent to light and lime when pptd. on a Hessian green earth base; more fiery, yellowish-green

tones, but less light resistant, on a white earth base; less brilliant and light-proof on a silica earth base. Typical analyses of these earths are tabulated. F. A. W.

Recent developments in spray painting. HENRY A. GARDNER. *Paint Mfrs. Assoc. of U. S.*, *Circ.* 114, 18 pp., Jan. 1921.—A review is given of the adaptability of spray painting to general use on interior and exterior surfaces of large area. This type of paint application will increase rather than diminish the amt. of work the master painter is called on to do, on account of the greater amt. of painting which will be stimulated by lower labor costs per job. Spray coats have been found equal to brush coats in durability. Portable spraying outfits, photomicrographs of sprayed films, etc., are illustd.

F. A. WERTZ

The pink coloration of white enamels. EGON MEIER. *Farben-Ztg.* 26, 59-60 (1920); cf. *C. A.* 14, 3805.—Extensive expts. gave no plausible explanation for the pink coloration of enamels contg. tetralin.

F. A. WERTZ

White enamel—tetralin. REBS. *Farben-Ztg.* 26, 242(1920).—It is very difficult to remove by heating all coloring matter derived from the seed hulls, from the linseed oil at present available (in Germany); on this account white enamels turn yellowish or pinkish. If the raw oil is clarified with 1 to 3%  $\text{CaB}_2\text{O}_7$ , or 1 to 2%  $\text{ZnSO}_4$ , added at  $260^\circ$ , allowed to settle, and the clear oil cooked with 10% to 20% tung oil, at  $275^\circ$ , a vehicle is produced which can be used for making white enamels perfectly free from discoloring with age, even though they contain tetralin. Objections to tetralin are its tendency to cause running and to reduce the gloss slightly, but these are overcome by using it in blends with  $\text{C}_6\text{H}_6$  and benzine (cf. preceding abstr.). F. A. WERTZ

The cause of the pink coloration of white enamels. LOUIS E. ANDES. *Farben-Ztg.* 26, 296-7, 356-7(1920).—A large no. of expts. indicate that the pink coloration of white enamels is not specific with tetralin thinners but may also occur with turpentine; that it occurs only when  $\text{MnB}_2\text{O}_7$  in powder form has been ground in the vehicle along with  $\text{ZnO}$ , or if the vehicle contains an excess of this drier. Varnish to which  $\text{MnB}_2\text{O}_7$  has been added, whether by heating or in the cold, must be aged and allowed to settle, or filtered to remove all suspended particles of the drier which may not have gone into complete soln. (cf. preceding abstr.).

F. A. WERTZ

The zinc oxide plant of the Utah Zinc Co. ARTHUR B. PARSONS. *Mining and Sci. Press* 121, 750-64(1920).—A description of the ore beds located at Murray, Utah; and of the plant arrangement and operation for producing Pb-free  $\text{ZnO}$ . Illustrated.

F. A. WERTZ

Ways and means of simplifying and cheapening the manufacture (of paint and varnish products). ANON. *Farben-Ztg.* 26, 588-91(1920).—A description with illu. of color tube filling machines, automatic packaging machines, etc. F. A. WERTZ

The paint and varnish industry. E. C. HOLTON. *Chem. Met. Eng.* 23, 1102-3 (1920).—H. disagrees with Toch's statement (*C. A.* 14, 3326) that prior to 1906 there was practically no scientific control of the paint and varnish industry. F. A. WERTZ

The paint and varnish industry. MAX TOCH. *Chem. Met. Eng.* 23, 1103(1920).—A reply to Holton (preceding abstr.).

F. A. WERTZ

Dope manufacture. MAURICE DESCHLINS. *Chem. Trade J.* 67, 603(1920).—The standard French airplane dope for winter use consists of cellulose acetate 80 pts.; benzyl alc. or phenol, 30 pts.; solvents and diluents, 880 pts. For summer use phenols are increased to 40, and solvents to 890 pts. Solvents and diluents consist of  $\text{Me}_2\text{CO}$ ,  $\text{MeOAc}$ , or Et formate, 410 pts.;  $\text{C}_6\text{H}_6$ , 250 pts.; alc., 220 to 230 pts.  $\text{EtOAc}$ , Bu formate or  $\text{MeCOEt}$  may replace solvents not to exceed 38%. Furfural may also be used in definite proportions. One gal. dope covers 7 yds. wing surface with 3 coats. Excess  $\text{C}_6\text{H}_6$  produces brittle films; excess alc., films of low tensile strength. The best manufg. practice is to add diluents to the ester, then the solvents, and finally the softening agents at a definite speed of stirring. Illustrated.

F. A. WERTZ

The condition of the German varnish industry. MANN. *Farben-Ztg.* 26, 178-80 (1920).

F. A. WERTZ

Darkening effect of different metal pots on varnish making. CHARLES HARRISON. *Paint, Oil Chem. Rev.* 70, No. 23, 10, 16, No. 24, 10, No. 25, 10-1, 18-21 (1920).—To det. the effect of the metal from which varnish kettles are made on the color of the products, H. conducted lab. heating expts. in Fe, Cu, Al, and Cu-Al alloy kettles. Each kettle was used in making a heat-bleached linseed oil, bodied oils, rosin-tung-linseed oil varnish, and congo-linseed oil varnishes. The products were graded on color to visual and to Lovibond tintometer inspection. In general, those made in Al kettle were palest, Al-Cu alloy next, Cu next, and Fe darkest, but results were not strictly uniform. Al kettles prevent gelatinization of tung oil so that it may be heated to 650° F. The Cu-Al alloy corrodes less than Cu on heating. Discussion of the paper questioned whether the same results would be obtained on large scale production, and emphasized the extreme importance of temp. on color of the products. Practical experience did not indicate that Al retards polymerization of tung oil. The heavy walls necessary in large Al kettles prevent rapid cooling of the batch; and large holes are without warning frequently burned through the bottom of the kettles. The latter is due to settling of dirt in the kettles thereby causing local overheating. The discoloration of varnish products is probably not due to soln. of the metal, but to its catalytic action on the O absorption of the oils. Expts. with kettles of SiO<sub>2</sub>, Al-coated Fe, and Fe-Si alloy were suggested. Standardization of kettle and fire pit dimensions is desirable.

F. A. WERTZ

Lime for the varnish industry. HENRY A. GARDNER. *Paint Manufs. Assoc. of U. S., Circ.* 113, 20 pp. (Jan. 1921).—To obtain a lab. method for detg. whether lime is suitable for use in varnish making, G. examd. many samples from varnish manufs. The gloss oil test method consists of melting 50 g. of rosin at 182°, adding 2 g. lime, raising the temp. to 260°, cooling to 205°, and thinning with 50 g. mineral spirits. In this test observe the rapidity of the reaction, clarity of the mass, amt. of sediment, and body, and det. acid no. of the varnish. The tung oil heat test method consists of stirring 1 g. lime into 50 cc. raw tung oil, and heating. Good lime usually starts to react at about 80°. Continue heating to 140°, cool and observe the amt. of insol. tung oil soaps formed. Results obtained on each sample with these tests, information secured from the manufs. on the behavior of the lime in actual practice, amt. of sample retained on a 250-mesh screen, and chem. analyses are tabulated. CaCO<sub>3</sub> is practically insol. in varnish products. High MgO limes give heavy-bodied varnishes that are inclined to be turbid or to ppt., although MgO neutralizes rosin as well as CaO. Soft, finely divided lime reacts more readily than hard, coarse, over burned lime. A suggested tentative specification for hydrated lime for use in varnish is: color, white; fineness, not more than 10% retained on a 250-mesh screen; reactivity, satisfactory in gloss oil and tung oil heat tests; CaO, not less than 70%, fully hydrated, equiv. to 92.5% Ca(OH)<sub>2</sub>; MgO, not more than 3%; Fe<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub> and insol. matter, not more than 2%; CO<sub>2</sub>, not more than 2%. Illustd. with photomicrographs, etc. A list of members of the Natl. Lime Assoc. is appended.

F. A. WERTZ

Tetralin as turpentine substitute. HERMANN VOLLMANN. *Farben-Ztg.* 25, 2386-8 (1920).—V. reviews the criticism of tetralin (*C. A.* 14, 3805) and believes that the most logical cause of the pink coloration of white enamels containing it is Mn. KMnO<sub>4</sub> cannot exist in an enamel film, but other Mn compds. such as Mn(C<sub>2</sub>O<sub>4</sub>)<sub>2</sub>·3H<sub>2</sub>O, used by Sacher for its detection, are also highly colored, and analogous compds. with ZnO might be formed in the films. Cf. *C. A.* 14, 357.

F. A. WERTZ

Tetralin as a factor in German economic life. HANS VON GWINNER. *Farben-Ztg.* 25, 2388 (1920).—A review of the use of tetralin to relieve the shortage of turpentine.

F. A. WERTZ

**The cooking and drying of tung oil.** ANON. *Farben-Zig.* 26, 358-9(1920).—The author disagrees with the method of Schlick (*C. A.* 14, 3161) for cooking tung oil. The best method consists in heating the rosin and tung oil together and then adding CaO and driers. Addition of linseed oil is usually not desirable except that 10 parts linseed plus 2 parts tung oil cooked to a heavy body in 5 to 6 hrs. at 280-90° produces a very satisfactory light-colored vehicle for white interior and exterior enamels which dry much harder than those made with bodied linseed oil alone. Addition of CaO causes whitening of the varnish films with H<sub>2</sub>O. To overcome this the rosin may be hardened by esterifying with glycerol and then blowing air through the molten ester. The heat treatment recommended by Schlick may overcome the "alligatoring" effect of combustion products on the film, but not the effect of drafts. The test for the latter is conducted by hanging a freshly varnished panel on a side of the window frame in a warm room and opening the window 1 to 2 cm. The air in passing out from the room will usually cause frosting in 1 to 2 hrs. on practically all tung oil varnish films even though they contain 20 to 30% linseed oil. This defect may be overcome by heating the oil to 280-90°, but since this is above its polymerization point, the heating cannot be carried out on an oil which does not contain rosin or fatty acids, except on a lab. scale. The hard drying film produced by tung oil makes possible the use of some soy oil in the cooking process.

F. A. WERTZ

**Furfural in varnish.** CH. COFFIGNIER. *Bull. soc. chim.* 27, 865-7(1920).—The role of furfural in a resinate varnish is merely that of a volatile solvent. Practical tests of rosin varnishes show no advantage in the use of furfural.

C. B. EDWARDS

**Auto-decomposition of linoxyn.** M. WEGNER. *Bedburg. Chem. Umschau* 27, 228(1920).—W. refers to Fritz's article on this subject (*C. A.* 15, 318) and confirms the observation that hardened linoleum can liquefy, stating 2 cases in detail: a ladder had formations of caoutchouc-like linoleum resembling icicles hanging from its rungs, liquefying and running off after standing 1/2 yr. in a sideroom of the chem. lab.; at the same time many samples of Walton linoleum which for several yrs. had been kept in the lab. in the form of rolls, began to drip and had to be removed. While Fritz considers such liquefaction a further stage of oxidation, W. believes it is a case of colloids, where a sol becomes a gel at first and later reverts back to the sol. condition.

P. ESCHER

**Slushing oils.** PERCY H. WALKER AND L. L. STEELE. *Bur. Standards, Tech. Paper* No. 176(1920).—The nature, desired properties, lab. tests, proposed specifications and general compn. of protective coatings (for exposed bright metals) which remain in a soft condition and can easily be removed at any time are discussed. The compn. of slushing oils is variable, but mixts. of the following compns. were found to pass all requirements: Formula A: 3 pts. candelilla wax; 6 pts. rosin, grade H; 50 pts. petrolatum (U. S. P.). Formula B: 2 pts. carnauba wax; 5 pts. rosin, grade H; 50 pts. petrolatum (U. S. P.). Proposed specifications: The material shall firmly adhere to all metal surfaces at all temps. to be met with under natural conditions and shall permanently remain in such condition that it may readily be removed by cotton waste wet with kerosene. On polished steel, iron, brass and copper surfaces at any temp. below 100° for not less than 5 days there shall be no stains or other evidence of corrosion. An oven salt-spray rain test is also specified and when time permits plates covered with the material should be exposed to weather test for 60 days with no appreciable rust in evidence as the result.

F. W. PADGETT

**100% turpentine shoe pastes.** LÜDBECKE. *Bensheim. Seifensieder-Zig.* 47, 815-6(1920).—The cheaper aq. shoe pastes have been largely displaced by oil-wax pastes which require turpentine as diluent. Turpentine is not produced in Germany and substitutes in the form of benzene, tetralin and "kienoel" (from pine stumps and

roots by dry distn.) have been used. At present "pure turpentine pastes" are extensively advertised and L. thinks this is a mistake in view of a new low-boiling hydrogenation product of the Tetralin Co. which promises to be a more perfect substitute for the imported turpentine. Cf. C. A. 14, 3810.

P. ESCHER

**Manila copal from Dutch India.** M. K. HEVNE. *Mat. grasses* 12, 5698-9 (1920).—A brief discussion of Manila copal and kauri resins as regards sources, botanical names, properties and methods of production.

C. B. EDWARDS

**Natural and artificial resins.** A. TSCHIRCH. *Schweiz. Apoth.-Ztg.* 58, 485-90, 503-6 (1920).—The conifer resin acids seem to fall into 2 groups; their types are the several abietic acids (A) and pimaric acids (B). A differ from B in m. p. and crystal forms, but also by showing an apparent ester no., although esters are absent; "enol" formation with replaceable H probably accounts for this reaction in the A group. Acid no. of A from Am. resin (*Pinus palustris*) is, resp., 188 and 192; sapon. no. 237.7 and 257.6; acid no. of B from French colophony (*P. maritima*) 171.5 and 171.7; sapon. no. 174.2 and 172.5. Canada balsam contains resins belonging to both groups. T. (1900) has shown that A and B, both isomers of  $C_{20}H_{30}O_2$ , are derivs. of retene,  $C_{11}H_{14}$ , which has a phenanthrene, probably also a terpene nucleus (Bamberger; cf. C. A. 7, 2388, 3972). Chem. relations of these acids to resinols and resinotannols also exist (C. A. 13, 1397). Among artificial resins are given bakelite, "resinit" (C. A. 4, 391, 679), albertol (C. A. 9, 1662) and coumarone resins (C. A. 8, 2249; 9, 2001; 13, 2601, etc.). T. suggests the synthesis of resins from retene of coal tar, and the conversion of resinous by-products of org. synthesis into artificial, useful resins.

S. WALDBOTT

**Paints.** J. RICHARD. *Brit.* 151,853, Nov. 19, 1919. A paint leather consists of linseed oil, amber, sugar of lead, benzene, and prepd. paint. The linseed oil, amber, and sugar of lead are heated together to 600° F. and then allowed to cool. The thick paste thus formed is dissolved in benzene and mixed with paint, preferably also thinned with benzene. Cf. C. A. 14, 2865.

**Varnish for electrodes of electrolytic cells.** T. A. EDISON. U. S. 1,364,359, Jan. 4. A varnish containing a coumarone or *p*-coumarone resin is used for coating electrodes of electroplating cells in order to prevent deposition of metal on selected coated portions.

**Filling and polishing composition.** M. J. WALSH. U. S. 1,362,907, Dec. 21. A compn. adapted for use as a filler and polish on painted and varnished surfaces is formed of a paraffin oil ("straw oil"), a fruit juice containing alc. in soln., coloring matter such as "crocein scarlet" and oil of citron. The mixt. is suitable for use on automobiles.

**Furniture polish.** J. F. JAMES. U. S. 1,363,419, Dec. 28. A furniture polish is formed of light paraffin oil 62.5, vinegar 31, turpentine 6 and camphor 0.5 part.

**Lithographic printing.** G. RUTHVEN. U. S. 1,364,523, Jan. 4. A flat impression is made on substantially inelastic unsized gutta-percha tissue, from an original, and transfers are then produced directly from the tissue by flat impression.

**"Ink stick."** J. C. OLSEN. U. S. 1,364,406, Jan. 4. A solid ink mixt. is prepd. from an aniline dye 4, Fe tannate 0.068, finely comminuted graphite 1-8 and dextrin 1-3 parts.

**Ink.** J. C. OLSEN. *Brit.* 152,465, Aug. 14, 1919. A solid ink suitable for making sticks or rods contains a water-sol. aniline dye, a comminuted water-insol. material such as graphite or kaolin, and a binding agent such as dextrin or gum, in proportions selected to give sufficient hardness, strength, and soly. without undue brittleness. Iron tannate may also be included. E. g., dye 4 g., iron tannate 68 mg., and dextrin 1, 2, 2, or 3 g., resp., with graphite 1.4, 3, 8, and 3 g.

## 27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

**Examination of fats and oils by volumetric method.** H. SCHLÜTER. *Seifensieder-Ztg.* 47, 907(1920).—A description of a volumetric method of an accuracy which suffices for rapid factory control work. Weigh 8–10 g. of fat and warm with 50 cc. alc. Add gradually enough KOH or NaOH of proper strength and boil on an asbestos plate for complete sapon., placing a funnel in the neck of the flask. Dist. the alc., take up the soap with some H<sub>2</sub>O and rinse into a separatory funnel, where the unsapon. matter is removed by shaking out with ether. Remove the ether soln. and transfer the hot soap soln. into a Lüring buret, adding 20 to 25 cc. dil. H<sub>2</sub>SO<sub>4</sub> and boiling. Fill the buret to the mark with boiling H<sub>2</sub>O, read the vol. of the acid layer and calc. its wt. by detg. its  $d_4^{20}$  with a 5-cc. pycnometer. A table of results is shown for 7 fats, in which the volumetric method differs by 0.09–1.38% from the regular method (shaking the fatty acids out with ether). The % fatty acids is also calcd. from the sapon. no. of the fat and the acid no. of the fatty acids and these calcd. values show generally slightly higher figures than the volumetric method.

P. ESCHER

**Progress in analytical fat chemistry during 1919.** W. FAHRION. *Chem. Umschau* 27, 225–8(1920).—A brief review.

P. ESCHER

**Chemico-commercial evaluation of fats.** O. STEINER. *Z. deut. Oel-Fett-Ind.* 40, 741–2(1920).—A plea to retain as sales basis for oils and fats the actual content of fatty acids as detd. by chem. analysis in place of the indirect pre-war method of detg. H<sub>2</sub>O, dirt and unsapon. matter and subtracting their sum from 100 in order to find “% saponifiable fat.” S. also desires a return to the use of petroleum ether for shaking out unsapon. matter in place of ethyl ether, which has come into use during and since the war. A special detn. of hydroxy fatty acids may become necessary for low-grade fats and oils; likewise a special regulation for sulfonated olive oils. In a postscript to this article F. Goldschmidt endorses S.’s views but objects to the return of petroleum ether, preferring ethyl ether instead.

P. ESCHER

**Method for the rapid and accurate determination of moisture in fats and oils.** HANS OERTEL. *Chem.-Ztg.* 44, 854(1920).—The method consists in adding a mixt. of 2 parts anhydrous MgSO<sub>4</sub> and 1 part kieselguhr to 10 cc. of oil and noting the max. rise in temp., which is reached in about 3 min. The H<sub>2</sub>O content is then read off from a table. To confirm the accuracy of the table increasing amts. of H<sub>2</sub>O were added to an oil and the temp. readings compared with the following results:

Water added %	Rise in temp.	H <sub>2</sub> O content from table %
0.5	0.7	0.5
1.0	1.3	1.0
1.5	1.9	1.5
2.0	2.7	2.0
2.5	3.4	2.5
3.0	4.2	3.1

E. SCHERUBEL

**Significance of the refractive index for the identification of oils and fats.** URZ. *Z. angew. Chem.* 33, I, 264, 268–9(1920).—The usefulness of this detn. and its application to individual oils and fats are discussed.

E. SCHERUBEL

**Unsaponifiable matter in neutral oils.** J. MARTIN. *Mat. grasses* 12, 5699(1920).—When the free acid is removed from an oil by means of NaOH the greater part of the unsapon. matter goes into the neutral oil. This is shown by 3 samples of karite oil: Unsapon. in crude oil 7.39%, in neutral oil 10.95%, in fatty acids 6.63%.

E. S.

**Determination of ammonia in oil and fat preparations.** K. BRAUN. Berlin-Wilmersdorf. *Z. deut. Oel-Fett-Ind.* 40, 725(1920).—Referring to Welwart’s article

under above title (C. A. 15, 184), B. repeats his former recommendation (*Seifensieder-Ztg.* 1905, 528) to add *concd.* NaOH to the *concd.* soap soln. so as to keep the soap in a salted-out condition and then to distil as usual. Or, dissolve a known quant. of soap in a 200 cc. flask, ppt. with  $\text{BaCl}_2$ , fill to the mark and filter; then distil a measured portion of the filtrate with NaOH.

P. ESCHER

**Recovery and use of wool-fat.** G. HARTMANN. Eisenach. *Seifensieder-Ztg.* 47, 868-9(1920); cf. C. A. 15, 443.—In the recovery of neutral wool fat by means of solvents the waste water containing wool fat is air-blown with enough  $\text{MgSO}_4$  soln. to obtain a flocculent ppt. which settles to the bottom, leaving the water still fat-turbid. The sediment is mixed by a blower with  $\text{Ca}(\text{OH})_2$  to which some  $\text{FeSO}_4$  has been added, and is immediately pumped into an elevated reservoir to be run into the filter press. The pressure is kept on the press until no more  $\text{H}_2\text{O}$  runs off. The filter cakes, which readily leave the filter cloths, are cut into bricks, air-dried in sheds and then in special ovens at  $110^\circ$ . The bricks now crumble easily and are placed in an extr., app. 2.5 m. high and 1.8 m. in diam., and the solvent (benzene) is introduced through a perforated pipe ring after pumping the air out. The wool-fat soln. is run into a still beneath the extractor. The still is started, the volatilized solvent condensed and run back over the material in the extractor; this operation is repeated until the bricks are exhausted. The extractor is connected with the condenser and the solvent in the extractor distd. off and collected, while the extrd. bricks are used as fertilizer. The contents of the still beneath the extractor (the wool-fat soln.) is run into a washing tank where by means of an agitator and steam it is boiled with an alc. soln. of NaOH and  $\text{Na}_2\text{CO}_3$  until a sample shows 2 layers: a clear yellow wool-fat layer above and a dark soap soln. below. After settling, the soap soln. is run into a cast-iron vat to be worked up into fatty acids by HCl, while the yellow wool-fat soln. is washed several times with dil. alc. to remove any soaps and is finally freed from its solvent by distn., yielding the "neutral wool fat" which may be further treated to improve its color and odor.

P. ESCHER

**An analysis of otoba butter.** WALTER F. BAUGHMAN, GEORGE S. JAMIESON AND DIRK H. BRAUNE. *J. Am. Chem. Soc.* 43, 199-204(1921).—The freshly extrd. fat has been described as being white, of the consistency of butter and having a nutmeg-like odor. The sample used in this work had become brown, had a disagreeable odor and showed the following consts.:  $d_{20}^{20}$  0.9293,  $n_{40}$  1.4710, I no. (Hanus) 54.0, sapon. value 185.0, m.  $34.0^\circ$ , essential oil 9.3%, other unsaponifiable matter 20.4%, fatty acids 67.6%. The essential oil is pale yellow, fading on exposure to light, has only a slight odor and shows  $d_{20}^{20}$  0.89087,  $[\alpha]_D^{20}$   $-32^\circ$ ,  $n_{20}$  1.4180; of 90 g. 71.8 g.  $b_{12-14}$  between  $126^\circ$  and  $190^\circ$ , the first and 6th fractions ( $b_{12}$   $126-9^\circ$  and  $b_{16}$   $176-90^\circ$ ) having the following consts.: C 87.25, 77.06; H 11.96, 11.48;  $d_4^{20}$  0.8935, 0.9348,  $[\alpha]_D^{20}$   $-17.84^\circ$ ,  $-6.9^\circ$ ,  $n_{20}$  1.4881, — ( $n_{20}$  for the 5th fraction,  $b_{14}$   $147-75^\circ$ , is 1.4970); the mol. wt. of fraction 2,  $b_{16}$   $134-7^\circ$ , is 204; all the fractions give the color test for cadinene. About 46% of the unsaponifiable matter is Uricoechea's otobite (*Ann.* 91, 369(1854))  $\text{C}_{15}\text{H}_{26}\text{O}_4$ , silky orthorhombic prisms from alc., m.  $137-8^\circ$ ,  $[\alpha]_D^{20}$   $-35.7^\circ$ , mol. wt. 310 (U. gives the compn.  $\text{C}_{24}\text{H}_{38}\text{O}_4$ ). The alc. mother liquors yield a small amt. of an isomeric *isotobite*, needle-like prisms, m.  $106-8^\circ$ . Either isomer gives with *concd.*  $\text{H}_2\text{SO}_4$  a pink color becoming very strong on standing and remaining unchanged for days; several drops  $\text{H}_2\text{SO}_4$  added to glacial  $\text{AcOH}$  solns. of either form gradually produces a pink color becoming somewhat purple after some hrs. and then remaining unchanged for several days. Neither form could be acetylated with boiling  $\text{Ac}_2\text{O}$  or methylated with  $\text{Me}_2\text{SO}_4$ ; fusion with KOH does not affect them, nor does *concd.* alc. KOH. Otobite gives 8.34-8.43% MeO by the Zeisel method while its isomer yields not a trace of AgI. With Br in  $\text{Et}_2\text{O}$  at  $5^\circ$  otobite yields what is apparently a *pentabromide*, (found Br, 54.36%), flat, very pale pink, monoclinic prisms, m.  $190^\circ$ . The *iso compound* (found



Br, 54.77%), similarly prepd. in AcOH, flat, monoclinic prisms, m. 191°. The amt. of unsatd. acids in the butter is small; 78 g. of the fatty acid mixt. (freed of unsaponifiable matter) yielded a 5.1 g. fraction with an I no. of 75.5 and giving no tetrabromide with Br. Among the satd. acids were identified lauric, myristic and palmitic; for their quant. detn. their Me esters were fractionated. The following %'s of glycerides were found: lauric 15.1, myristic 52.2, palmitic 0.2, oleic 3.9. The unsaponifiable matter contains 9.4% otobite and iso-otobite and 11.0% of a viscous material. C. A. R.

**Theory of polymerization in fatty oils.** ARTHUR H. SALWAY. *J. Soc. Chem. Ind.* 39, 324-8T (1920).—S. offers the suggestion that in the process of polymerization there is first a liberation of one or more fatty acid radicals, which then condense with the unsatd. linkages of the fatty oil. The result of this condensation is a partial satn. of the fat with one glycerol hydroxyl group becoming free. At the high temp. required for polymerization such a compd. might be expected to condense with the formation of a polyglycerol deriv., thus accounting for the increased wt. of a polymerized oil. There is a decrease in I no. and acid no. in such an oil and this is explainable by the union of a carboxylic group of a fatty acid with an unsatd. linkage. Exptl. evidence for this conclusion was obtained by heating fatty acids from linseed and palm oil at 270° for 6 hrs. in the presence of CO<sub>2</sub>. There was a reduction in I and acid no. in the case of linseed oil only. Since fatty acids can combine with unsatd. linkages it is reasonable to conclude that a similar reaction would occur between a fatty acid and an unsatd. glyceride in the manner suggested in the first stage of polymerization. The free fatty acid required for the reaction may be present in the fat or formed during the process; and there is reason to believe that all fats when heated to 250 to 270° undergo a kind of dissociation. If this view of the first stage in the polymerization is correct, the introduction of fatty acids should hasten the reduction in I no. On the other hand, if free fatty acid formation is retarded the reduction in I no. on heating should also be retarded. That this is actually the case was shown by polymerizing whale oil in the presence of an excess of fatty acids on the one hand and an excess of glycerol on the other hand. The results indicated a reduction in I no. from 121 to 97.6 with 3% fatty acids and a retardation of the reduction with the addition of 10% of glycerol. The evidence is less convincing regarding the 2nd stage of the theory involving a condensation of the glyceryl radical. According to this view the glycerol obtained from a polymerized oil should contain polyglycerol, but no evidence to this effect has yet been obtained. It is known that monoglycerides when highly treated undergo change with elimination of water. If monostearin is heated at 180° for several hrs. the amt. of free hydroxyl is considerably reduced—as can be shown by detns. of the acetyl value. There is thus evidence to show that the reactions formulated may readily proceed under the conditions of polymerization. E. SCHERUBEL

**Sting-ray liver oil.** W. DONOVAN. *Trans. & Proc. New Zealand Inst.* 52, 29 (1920).—A sample of oil from the liver of the sting ray (*Dasyatis brevicaudatus*) was examd. at the Dominion Lab., New Zealand, and found to resemble cod-liver oil in every respect. It was found to have: d<sub>4</sub><sup>20</sup> 0.927, sapon. no. 189, I no. 156.5, n<sub>D</sub><sup>20</sup> 1.4796, unsaponifiable matter 3.7%, hexabromides 45%. L. E. GILSON

**Cantaloupe-seed oil.** WALTER F. BAUGHMAN, DIRK BRAUNS AND GEORGE S. JAMIESON. *J. Am. Chem. Soc.* 42, 2398-401 (1920).—The cold-pressed virgin oil is pale yellow, smells like olive oil, has a pleasant fruity taste and shows the following consts.: d<sub>4</sub><sup>20</sup> 0.9210, n<sub>D</sub><sup>20</sup> 1.4725, I no. (Hanus) 125.9, sapon. value 192.3, Reichert-Meissl number 0.35, Polenske no. 0.26, Ac no. 15.8, acid value 0.43, unsaponifiable matter 1.1%, sol. acids (% PrCO<sub>2</sub>H) 0.4, insol. acids 94.0%, unsatd. acids 79.2% (I no. 151.8), satd. acids 15.3% (I no. 10.0). Although the I no. indicates that it might be a semi-drying oil, no film formed even after 1 week's exposure to the air on a glass plate. It does not easily become rancid (the sample studied had been kept 2 yrs. in a stoppered

bottle). The unsatd. acids with Br give no hexabromide but much linoleic tetrabromide and from the I nos. it is calcd. that they consist of 67.6% linoleic and 32.4% oleic acid. From the I nos. and the sapon. values of the various fractions obtained by converting the satd. acids into the Me esters are calcd. the mean mol. wts. of the satd. esters uncontaminated with unsatd. esters (*C. A.* 14, 2271). Stearic, palmitic and myristic acid were isolated. The oil, which is 30.4% of the seeds, contains, besides 1.1% of unsaponifiable matter, the following % of glycerides: myristic 0.3, palmitic 10.2, stearic 4.5, oleic 27.2, linoleic 56.6.

CHAS. A. ROUILLER

**Manufacture of soap powder.** A. Z. *Seifensieder-Ztg.* 47, 908-9, 929-30 (1920).—Soap powder is manufd. by dissolving a settled soap in a known amt. of hot H<sub>2</sub>O, mixing the soda ash with it and running the resulting mass on a cement or iron floor and breaking up the mass during cooling; several slight modifications of handling are mentioned.

P. ESCHER

**Fat cleavage methods in the soap industry.** C. KNIGGE. Berlin-Lichterfelde. *Seifensieder-Ztg.* 47, 828-9, 847-8, 867-8 (1920).—A description of the industrial operations of fat cleavage by the autoclave, Twitchell and fermentation methods. Preliminary purification: The oils are purified with 1.5-2% of 60° Bé. H<sub>2</sub>SO<sub>4</sub>, while the oil is blown at 50 to 70° for 30 to 60 min. (I) *Autoclave method.* The Cu autoclave is half filled with oil; 1% Zn dust and 20% H<sub>2</sub>O are added and the whole boiled at 6 atm. for 6-8 hrs., when cleavage has reached 90-95% free fatty acids. After removal of the glycerol water, the fatty acids together with the resulting Zn soaps are treated with 11 lbs. of 10% H<sub>2</sub>SO<sub>4</sub> for each lb. of Zn dust in order to decompose the Zn soap. The fatty acids are then washed and are ready for the soap kettle. (II) *The Twitchell method.* To the oil is added about 25% by wt. of condensate water (or glycerol water II) and 1% H<sub>2</sub>SO<sub>4</sub> in form of a dil. soln., and while boiling under full steam pressure 0.5-2% of Twitchell reagent is added. The steam is then reduced to 5 lbs. and boiling continued for 10-12 hrs. When finished, some steam is admitted through a pet cock just over the surface of the oil to prevent darkening of the acids by contact with air. The resulting glycerol water I contains 12 to 15% glycerol if normal fats have been used. The fatty acids are boiled a second time with H<sub>2</sub>O as before for 10-12 hrs., and the H<sub>2</sub>SO<sub>4</sub> neutralized with BaCO<sub>3</sub>, furnishing glycerol water II and the acids ready for soap making. (III) *The fermentation method.* A Pb-lined Fe tank with a closed and open steam coil with agitating blower is charged with the oil and 35% by wt. of H<sub>2</sub>O and brought to the proper temp., viz., 23° for oils, never below 20°, the action of the ferment then being too slow. Solid fats are brought to just above their m. p., but never above 43°, which would kill the ferment; harder fats must be softened by addition of oil; 4 to 6% of ferment is added for oils of 200 sapon. no., and 8% for 250 sapon. no. Tallow which melt above 40° require 10% of the ferment; 0.2% MnSO<sub>4</sub> is added as a catalyzer. When thoroughly emulsified, the tank is covered and allowed to rest 24 hrs. when cleavage reaches 80%, and after 48 hrs. it reaches 90%. Analytical control at this point is essential. The mixt. is now heated to 80°, and mixed by a blower with 4 kg. of 50° Bé. H<sub>2</sub>SO<sub>4</sub> per 1000 kg. of fat and allowed to rest. It soon separates into 3 layers: (1) the glycerol water on the bottom, (2) the clear fatty acids on top and between both lies (3) the middle layer, several charges of which are accumulated and boiled with H<sub>2</sub>O. After settling, the fatty acid layer is ready for sapon. The selection of the proper cleavage method depends largely upon factory conditions. The advantages and disadvantages of the 3 methods are given. Appended to the article is a description of the author's methods of chem. control and calcn. of the % of cleavage from the acid, sapon. and ester no.

P. ESCHER

**Historical notes on glycerol manufacture.** C. DEITE. *Z. Deut. Oel-Fett Ind.* 40, 757-9 (1920).

P. ESCHER

Recovery of grease from effluents (GARNER) 25. Surface tension of certain soap solutions and their emulsifying power (WHITE, MARDEN) 2. Points on buying caustic soda (GOLDTHWAIT) 18. Hydrating anhydrous substance; soaps (BRIT. PAT. 149,623) 13.

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The "sweetening off" of carboraffin used to clarify refinery juices according to Stanek's method. VL. SKOLA. *Listy Cukrovar.* 38, 183-8(1920); *Z. Zuckerind. czechoslov. Rep.* 45, 89-95(1920).—To obtain a more complete idea of the economic value of Stanek's carboraffin process, S. studied the procedure for the "sweetening off" of the used decolorizer (*C. A.* 13, 1544, 2613). 1000% of water, based on the amt. of carboraffin used, was necessary for the sweetening off of the carboraffin to a sugar content of less than 1%. The first 300% of the sweet water was utilized for the remelting of sugar, the remainder for further sweetening. The purity of the sweet water decreased slowly at first due to the mechanical admixt. of sirup still present in the press. Later the decrease in purity became more rapid. The soly. of the color absorbed by the carboraffin increased with the alkalinity of the sweet water used. The fact that the final portions of the sweet water were low in color, despite the high color content of the carboraffin, indicated that the absorbing quality of the active carbon is much more pronounced in dil. than in concd. sugar solns. The lowering of the temp. during the process reduced the rapidity of flow and the effectiveness of the "sweetening off." The purity of the sweet water was higher, since the soly. of the absorbed non-sugars increases more rapidly with increasing temp. than the soly. of sugar. The alkalinity rose to a max. and then fell off gradually. The filtration of refinery liquors with carboraffin according to Stanek's method requires only  $\frac{1}{10}$  the amt. of sweet water that is required for the ordinary bone-black filtration and the sugar loss is reduced to  $\frac{1}{4}$ . The purity of the sweet water in Stanek's method decreases more gradually. The time necessary for the "sweetening off" process is also lowered considerably.

JOHN M. KRNO

The solubility of gypsum in juices saturated at different alkalinities. VL. STANEK. *Listy Cukrovar.* 38, 289-90(1920).—S. has previously shown that gypsum is completely pptd. into the carbonatation sludge (*C. A.* 15, 187). The results of further expts. indicate that the soly. of the gypsum in a neutral or a very slightly alk. juice at 85°, corresponding to the filtration temp. of the satd. juice, is higher than is given by Jacobsthal (*Deut. Zuckerind.* 1868, 662) and Bruhns (*C. A.* 1, 787) for dil. sugar solns. The soly. decreases with the increased alkalinity of the juices, but even in the most alk. juice at 85°, it is greater than that found by Bruhns (*loc. cit.*) in pure sugar solns. whose alk. ranged from 0.057 to 0.062% CaO. The soly. also depends on the nature of the juices. The soly. is lowest in an imperfectly satd. juice. This is explained by the fact that this juice contained a quantity of gypsum dissolved in it previously, indicated by the amt. of lime present in the form of org. lime salts which were abnormally high. The soly. of gypsum is high enough under all conditions to cause all the  $\text{CaSO}_4$ , usually present in the carbonatation sludge, to be completely dissolved. Therefore, the pptn. of gypsum into the sludge at the 1st satn. may be explained by ascribing this to mechanical pptn. or to the formation of an insol. combination of  $\text{CaSO}_4$  and  $\text{CaCO}_3$ , and not by the lowering of the soly. of the gypsum due to a higher alkalinity. J. M. K.

A provision against the evaporation during filtration of sugar solutions that are to be polarized. J. J. WEISS. *Listy Cukrovar.* 38, 155(1920).—Considerable error was introduced by this factor until a closed system of filtration was used.

JOHN M. KRNO

**Frothing of juices and its prevention.** ASKAN MÜLLER. *Z. Zuckerind. czechoslov. Rep.* 44, 113-4(1920).—The frothing of juices flowing into measuring tanks, preheaters and malaxators is at times very troublesome. The addition of grease or oil keeps this frothing within bounds. A considerable part of it is due to the mechanical admixture of air with the juice as it enters or leaves the tank. A mechanical device for the prevention of this mixing is described.

JOHN M. KRNO

**A trap for removing the sand in the mixture of raw juice and lime milk before this enters the first malaxator.** FR. PAULIK. *Listy Cukrovar.* 38, 370-1(1920).—A description is given of a device for trapping fine sand and coke still remaining in the lime milk after this has passed through a separator for coarse impurities.

JOHN M. KRNO

**The opposite effect of chlorides and sulfates on starches.** H. COURTONNE. *Compt. rend.* 171, 1168-70(1920).—Very concd. solns. of certain chlorides cause the formation of gels from flour and starches at room temps. Heated at 115-120° sol. starch is formed. In order of increasing effect are the chlorides of Ca, Ba and Mg. Starch heated to 115° with a concd. soln. of  $MgSO_4$  does not swell at all. It is suggested that these differences may be useful in analytical work and in com. practice.

T. G. P.

**Researches on plant colloids. X. The action of formaldehyde on starches.** M. SAMEC AND ANKA MAYER. *Kolloidchem. Beihefte* 13, 165-92(1920).—At room temp. HCHO forms with starch a loose hydrated compd. which no longer shows the usual I reaction and does not vary greatly from starch in mol. size or in dialyzable fraction. The sp. gr. of formalin-starch solns. is somewhat greater than that of ordinary starch, and their viscosity greater. HCHO is able to inaugurate resynthetic processes in the diastatic decompn. products of starch, but at higher temps. it is oxidized to acid which effects decompn.; it also slightly reduces the rotatory power. The influence of HCHO on the properties of starches resembles that of 5 to 10.10<sup>-3</sup> N KOH; both are comprehensible on the assumption of a readjustment following the opening up of an O ring. HCHO reacts indiscriminately with amylopectin and amylose, without materially altering their proportions, and inhibits the degradation of amylose.

J. A.

**Gum arabic. Its collection, marketing, and chemical characteristics.** J. A. RIDGWAY. *Can. Chem. J.* 4, 330-4(1920).—The best quality of gum arabic is collected from the *Acacia verec* or *senegal*. An inferior grade, *talha* or *ghezireh*, comes from *Acacia seyal*. The trees grow wild but are also cultivated. The latter usually yield better gum. The com. grades are (1) natural, (2) cleaned, (3) cleaned and sifted, and (4) bleached. (1) contains bark and has not been picked, (2) has been picked over and the bark and straw removed; (3) is the same as (2) except that it has been sieved to remove the gum dust and sand; and (4) is gum which has been sun-bleached. (3) is usually the most economical and (4) is mainly used for pharmaceutical purposes. The gum should contain 12 to 20%  $H_2O$ . Both color and taste go together and are due to tannins. The color varies with the size and condition of solutions. Usually  $[\alpha] = -32$  to  $-34$  but it varies and may even be positive. Contracts are made upon description. The work of O'Sullivan (*J. Chem. Soc.* 45, 41; 57, 59), Beam (*C. A.* 6, 2018) and Edie (*C. A.* 6, 2019) is reviewed.

WM. STERICKER

**Determination of glucose and starch (QUISUMBING) 7. *Pegomyia hyoscyami* Panz (RAMBOUSEK) 15. A pseudotannin from sorghum (STADNIK) 16. Apparatus for converting cellulose into glucose (U. S. PAT. 1,362,875) 23.**

**CHAUDUN, ANDRÉE: Recherches physico-chimiques sur l'inversion diastasique du saccharose.** D. Sc. thesis, Univ. Paris. Masson et Cie., Paris, 120 Bd. Saint Germain. For review see *J. fab. sucre* 61, No. 44(1920).

## 29—LEATHER AND GLUE

ALLEN ROGERS

Synthesis of tanning substances. GEORG GRASSER. *J. Am. Leather Chem. Assoc.* 16, 20-46(1921).—See *C. A.* 15, 326.

E. J. C.

Advances in the preparation of plastic masses from casein and other proteins. S. HALEN. *Kunststoffe* 10, 201-2(1920).—Review of the patent literature. C. J. West

Pelt dyeing. OTTO BERTHOLD. *Deut. Färber-Ztg.* 56, 845-6(1920).—After tanning the pelt which is to be dyed is prepd. by maceration in a 1-3° Bé. NaOH soln., then washed in a large amt. of 0.5% Na<sub>2</sub>CO<sub>3</sub> soln. In place of NaOH, milk of lime, Na<sub>2</sub>CO<sub>3</sub> or NH<sub>4</sub>OH of corresponding concn. may be used. The temp. should not be above 30°. The skins are then washed free of alkali, are made slightly acid with AcOH or HCOOH and again washed. Mordanting previous to dyeing yields faster colors. The following mordants are recommended, the amts. in each case to be added to one liter of water: (1) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> 2 g., tartaric acid 1, CuSO<sub>4</sub> 0.25. (2) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> 2, tartaric acid 1. (3) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> 2, AcOH 1-2 cc. 30%. (4) CuSO<sub>4</sub> 5, AcOH 1-2 cc. 30%. (5) FeSO<sub>4</sub> 2-5, AcOH 1-2 cc. 30%. (6) Iron liquor 20-50 g. 30° Bé. These mordants may be used singly or in mixts. at a temp. of 25-30°. For dyes ursols are recommended the dye being formed on the hair by the oxidizing action of H<sub>2</sub>O<sub>2</sub>, the complete effect requiring 4-18 hrs. A fine deep black on rabbits' pelts is obtained, after the usual preparatory treatment, by mordanting with CuSO<sub>4</sub> and AcOH for 15 hrs. at 30° and thorough washing, then dyeing in a bath containing ursol D 6 g., ursol DG 2 g. and 120 cc. H<sub>2</sub>O<sub>2</sub> soln. for 15 hrs. at 30-35°. The pelts are then thoroughly washed and placed in a fresh cold bath containing CuSO<sub>4</sub> 0.5 g. per liter for 2-3 hrs., centrifuged without washing, and the leather coated with a soln. containing NaCl 200 g., glycerol 100 and egg yolk 40 per liter, when the pelts are dried, stretched and finished.

L. W. RIGGS

A pseudotannin from sorghum (STADNIK) 16. Effect of humidity on leather belting (ROYS) 13. Waterproofing composition (for leather) (U. S. PAT. 1,364,567) 25. Combining sheet material (BRIT. PAT. 152,275) 30. Softening leather (BRIT. PAT. 151,744) 18.

Substitute for sole leather. VON HEYNITZ. Ger. 320,629, Nov. 7, 1917. Birch bast is soaked in a hardening soln. which fills the pores and waterproofs the bast, without deleteriously affecting the flexibility. The bast may, for example, be treated with a glue soln. to which has been added K<sub>2</sub>CrO<sub>4</sub> or gallotannic acid, or with viscose or an acetylcellulose soln. Also resin acid, with Al salts or casein that has been rendered insol. can be used.

Coloring leather. A. E. JOHNSON. U. S. 1,362,627, Dec. 21. In making turn-soles of shoes, the margin is inked on the flesh side and then is simultaneously molded and ironed to burnish the inked portion which is visible in the finished shoe.

Tanning. F. GILARDINI. U. S. 1,363,771, Dec. 28. Different portions of a hide are successively tanned while the intermediate portions are protected from the action of the tanning material. The latter is supplied to the hide through compartments of press plates between which the hide is held.

Iron salts in tanning. O. RÖHM. U. S. 1,364,316, Jan. 4. Leather is produced from skins by treatment with CH<sub>2</sub>O soln. and NaHCO<sub>3</sub> soln. and subsequent treatment with basic Fe chloride.

Tanning with iron salts. O. RÖHM. U. S. 1,364,317, Jan. 4. Skins to be tanned are treated with basic Fe chloride and then treated with a precipitant, e. g., a soln. of NaHCO<sub>3</sub>, and with CH<sub>2</sub>O soln. or other aldehyde compd.

**Tanning, etc.** ELEKTRO-OSMOSE AKT.-GES. (GRAF SCHWERIN GES). Brit. 152,641, Aug. 16, 1920. Material to be treated by any tanning, impregnating, or like process is submitted to a preliminary treatment consisting in subjecting it to the action of an elec. current in pure  $H_2O$ . This is stated to shorten and render more economical the subsequent process and also to have a deliming effect. The preliminary treatment in pure  $H_2O$  may be conducted with diaphragms or the hide, etc., may be suspended between two poles and subjected to the elec. current. The subsequent treatment may comprise electroosmotic tanning or mechanical tanning or a combination of these processes. In an example, an ox hide delimed with dil. formic acid is electrically treated in pure  $H_2O$  for 10 hrs., being then electroosmotically tanned in chestnut wood ext. of 2° Bé. and subsequently mechanically tanned with a similar ext. of 3° Bé. In another example, after the preliminary treatment in  $H_2O$ , bark- or chrome-tanned leather is impregnated or fatted by electroosmotic treatment with dégras in soap soln. for 8 hrs.

**Solutions for tanning, from waste liquors of the cellulose manufacture.** W. H. PHILIPPI. Ger. 321,331, Sept. 29, 1915. The lye, as it comes from the boiler, makes its way along an extended way provided with resistances wherein the lye slowly gives up destructive substances, either by evapn. ( $SO_2$ ) or upon cooling or pptn., thereby preventing the breaking down of valuable extr. constituents. Pptg. agents are added in small amts. at different points along the line of flow. The agitation resulting from the passage of the lye over the resistances facilitates the sepn. of cryst. substances such as  $CaSO_4$ , and the oxidation and sepn. of the Fe compds. contained in the lye. The removal of the free  $SO_2$  can be expedited by the introduction of  $CO_2$  gas. The ext. obtained has strong tanning properties and low ash.

**Deliming and tanning skins.** CHEM. FABRIK ROSENBERG & CO. Ger. 320,301, Oct. 9, 1918. The limed hides are treated with liquids obtained by dissolving lime-free, purified and concd. neutral or acid sulfite-cellulose waste lye in glycerol waste pitch in salve form, and then dilg. with  $H_2O$ . E. g., 160 parts glycerol waste pitch are worked up into a salve with 100 parts  $H_2O$ , and in this are dissolved 80 parts lime-free, neutral, purified, concd. sulfite-cellulose waste lye. This concd. soln. is then diluted with  $H_2O$  as required. The skins from the liming pit are introduced into this diluted soln. A suitable diln. is 1 part of the sulfite-cellulose waste lye and glycerol waste pitch mixt., to 5 to 7 parts  $H_2O$ . The skins are claimed to lose the lime completely, as well as the pores open, and become more pliant.

**Waterproofing and non-skid treatment of leather.** A. McLENNAN. Ger. 320,621, Aug. 29, 1913. The leather is treated with a soln. contg. rubber, celluloid, juniper gum and amber resin. From 15 to 20 skins, of av. wt., are treated for some time in a drum with a rubber soln. composed of 2.25 kg. fine hard para gum in 22.7 l. naphtha and 37.8 l. benzene, a soln. of celluloid in acetone is added, and then, in suitable intermediate chambers, are added juniper gum dissolved in  $Me_2O$ , amber resin dissolved in benzene, and approx. an equal amt. of naphtha or a little benzene.

**Glue from horn substance.** F. SCHMIDT. Ger. 321,382, Dec. 4, 1917. The horn substance, without the addition of  $H_2O$ , is heated in the autoclave for a long time at temps. above  $200^\circ$ . The product is dissolved in hot  $H_2O$ , without previous clarification, for use as an addition to lime wash and the like.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

**Future rubber research.** ANDREW H. KING. *Chem. Met. Eng.* 23, 449-50 (1920).—Present lab. and manuf. methods are criticized. The need for rubber physicists is especially emphasized. The immediate need is the development of testing methods and machines for detg. accurately such properties as plasticity, hysteresis, hardness,

resistance to abrasion, resistance to repeated stretching and tearing, and aging worth. The lack of suitable testing machines is made apparent. When these difficulties are overcome, development of compounding can proceed, aided by the newer discoveries of the relation of these properties to the size and surface nature of the individual particles of corresponding ingredients. The physical properties enumerated should be correlated to the vulcanization coeff. and the latter used as a check on operation. The development of accelerators is deemed to have advanced out of proportion to other lines of research and should temporarily be allowed to rest. Other problems described are improvements in tire design to eliminate internal friction and to prevent ply sepn. In the factory there is need for continuity of building and vulcanization, and better temp. control during milling and calendaring. An American Research Organization is advocated.

A. H. SMITH

Guides to analyses. III. The interpretation of rubber analyses. JOHN B. TURTLE. *Chem. Bull.* 7, 322-4(1920).—A brief history is given of the development of the analysis of vulcanized rubber in America. The constituents of a vulcanized rubber compd. are divided into 4 parts: (a) rubber; (b) sulfur; (c) accelerators; (d) fillers. Analyses should be so worked out as to develop the facts regarding these four groups, and the significance of these facts detd. by experienced rubber chemists. For the analysis of materials bought under specifications, the exact procedure should be a part of the specification, since, owing to the peculiar nature of the problem, the results of the analyses of vulcanized rubber compds. are as yet inseparable from the methods by which they were obtained.

J. B. T.

Vulcanizing accelerators. G. WILHELM. *Kunststoffe* 10, 217-8(1920).—Patent review.

C. J. WEST

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Toron finish on cotton goods (MILLER) 25.

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Rubber mixture. J. C. BURDETTE. U. S. 1,363,229, Dec. 28. A material suitable for the manuf. of shoe heels or soles is formed by heating a mixt. of bituminous material such as gilsonite, vulcanized rubber and  $H_2O$  to a temp. of steam under 65 lbs. per sq. in. pressure, adding a small amt. of virgin rubber to the mixt. and vulcanizing it, with S and other ingredients such as  $MgO$ ,  $Fe_2O_3$ , cotton and petrolatum.

Vulcanizing rubber. C. R. BOGGS. U. S. 1,364,055, Dec. 28. Se or a Se compd. and a vulcanization accelerator such as *p*-nitrosodimethylaniline is added to a mixt. of rubber with inert material such as  $ZnO$  and whiting before vulcanization, in order to employ the Se or Se compd. (with or without S) for vulcanizing.

Vulcanizing rubber or similar substances. C. R. DELONG and W. N. WATSON. U. S. 1,364,732, Jan. 4. Dichloroaniline 0.5-5% is added to rubber or similar substances before vulcanization, in order to accelerate vulcanization with S.

Composition for sealing punctures in tires. N. O. SELBY. U. S. 1,363,438, Dec. 28. A compn. for sealing punctures in pneumatic tires is formed of ground wood (1.75, comminuted mica 11.75, soapstone 6.5 and  $H_2O$  70 parts.

Pneumatic tires. GOODYEAR TIRE & RUBBER CO. Brit. 151,978, Sept. 1, 1920. The foundation of a tire consists of layers of rubberized fabric built up on a core, covered with a thin layer of rubber and partially vulcanized within a mold. The tread portion is roughened and coated with cement and a slab of raw rubber, which may be extruded from a machine or may be laminated, is applied and rolled into place to form the tread. The vulcanization of the whole tire is completed under pressure in a rigid mold.

Combining sheet material. J. BROWN. Brit. 152,275, Apr. 6, 1920. Leather is united to sheet rubber or leather through the medium of an intervening sheet of "vulcanizing compd." (rubber and S) with "vulcanizing soln." (a soln. of rubber and S) as adhesive. The process is applicable to soles and heels of boots and shoes.

